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THE GERMAN PASSIVE AIR DEFENSE SERVICES

by

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Part II

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V. PASSIVE AIR DEFENSE FORCES.

The establishment of specific passive air defense forces started at a relatively late juncture. No mention of any such forces is contained in the preliminary plans for mobilization. The ruling viewpoint at the time was that the Safety and Auxiliary Service units in Category I passive air defense localities, and particularly motorized battalions of that ^{service} stationed in such localities for off-post commitment, were adequate to restore any damage caused by air attack and to handle any other pertinent missions.

The efforts of the Inspector of Passive Air Defense to convince the appropriate authorities of the necessity for specific passive air defense forces as a separate arm or service succeeded only when the air attacks against German territories reached large proportions, and when not only the Safety and Auxiliary Service units (motorized) had to be increased, but additional personnel also had to be made available for smoke-screening operations, for the servicing of dummy installations, and for the passive air defense supply installations and equipment depots.

The Passive Air Defense Services comprised the following:

417. See VIII, d, 2, below.
 418. See VIII, d, 3, below.
 419. See VII, below.

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(a) Passive Air Defense Regiments, containing a varying number of motorized battalions each.⁴²⁰

(b) Smoke-Screening Battalions.

(c) Special Purpose Passive Air-Defense Battalions, for the servicing and operation of dummy installations.

(d) Passive Air Defense Replacement Battalions.

(e) The Passive Air Defense School.

(f) The Passive Air Defense Instruction Company, organic⁴²¹ to the Reich Institute of the Air Force for Passive Air Defense

(g) Bomb Disposal Units.

(h) Passive Air Defense Equipment Depots (in personnel matters).

Personnel Strength. According to records of the Air Force High Command/ Branches 6 and 9 available for study, personnel in the passive air defense services totalled as follows:

Status 15 February 1945

Uniformed personnel	35 600
Auxiliary personnel	<u>23 900</u>
Total	59 500

Status 1 April 1945

Uniformed personnel	30 000
Auxiliary personnel	<u>18 500</u>
Total	48 500

420. For more details on the Passive Air Defense Services see Karlsruhe Document Collection: Die LB-Abteilungen (mot.) der Luftwaffe im 2. Weltkrieg, by Hans Woerringen, 1956, which deals primarily with the passive air defense regiments and motorized battalions.

421. See III, g, 1, above.

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a. Motorized Passive Air Defense Battalions.

1. Organization and Equipment. Activation of the Motorized Passive Air Defense Units.

The initiating step was the incorporation into the Air Force of the Safety and Auxiliary Motorized Battalions, redesignated as Passive Air Defense Motorized Battalions. These units already were awarded first priority in the allocation of spaces in military billets, and received their operational orders from the air district command in whose area they happened to be stationed. Their other logistical and personnel requirements were handled by the local police authorities in the garrison town. These dual channels of command control on the one hand and logistical supply responsibilities on the other, plus the unclear disciplinary conditions within the battalions, in the long run produced intolerable circumstances which was particularly complicated because the Safety and Auxiliary Battalions consisted of members of the security police forces, of the firefighting forces, and of the ~~XXXXXXXXXX~~ ~~XXXXXXXXXX~~ Safety and Auxiliary Service.

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This was the reason for transfer of the battalions to the Air Force in 1942. The final step in this transfer was that the officer personnel in the battalions were taken into the officer corps of the Air Force in March 1942.

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be awarded the rank of 2d Lieutenant (Passive Air Defense) on recommendation by the appropriate air district command. For all other purposes promotion was subject to the regulations applicable to officers in recalled status (Offizier zur Verfügung).

As taken over from the Safety and Auxiliary Service, the motorized passive air defense battalions were organized as follows:

Battalion Headquarters Staff

1st(Fire-Fighting and Decontamination) Company
 2d " " " " "
 3d (Repair) Company.

The authorized battalion strength in commissioned officers, noncommissioned officers, and men at the time was 579, and each battalion had the following vehicles:

12 fire engines, Type 25
 6 trailer-mounted power pumps
 4 decontamination trucks
 2 decontamination equipment trucks
 4 power operated ladders
 4 hose trucks
 8 repair personnel carriers
 1 bomb removal truck
 1 air-compressor truck
 1 tools and accessory truck
 6 ambulance trucks
 3 medical equipment trucks

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309 1 telephone construction truck
 1 signal car
 3 fuel tanker trucks

310 5 truck-mounted field kitchens
 5 truck-mounted offices, etc. (Wirtschafts-LKW)
 1 office-supplies truck
 1 repair-shop truck
 1 artisan personnel truck
 3 reserve trucks
 20 motorcycles, 8 of them with sidecar
20 cars
 127 motor vehicles in total.

Travelling at a speed of 24 miles, and with its vehicles spaced accordingly, a motorized passive air defense battalion took up almost 4 miles of road space.

All vehicles were of the latest models, and as air warfare became increasingly intensified everything possible was done to improve all equipment and adapt it in the light of the latest experience. Thus, the battalions received sound locating instruments to expedite the finding of persons buried alive, and radio equipment to insure secure transmittal of orders and other information.

The following data is offered to illustrate the performance capacities of some items of heavy equipment:

Fire Engine Type ES 25. This was a fire engine intended for large scale operations, and which met all standards of requirement. It had a 110 hp engine which, besides driving

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the truck provided the power for operation of the pump. The pump had fittings for two type A suction hoses and for six type B pressure hoses. Maximum performance was 2 500 liters per minute, which was the reason for the identification of the pump as KS 25. The pump was also fitted to eject a foam spray, and each fireengine carried along 220 pounds (100 kilogram) of foam chemicals which could produce 100 cubic meters of foam.

Fire Engine Type KS 8. This was far more maneuverable vehicle, with a pumping capacity of 800 liters per minute, which was not as restricted to roads for movement.

Hose Trucks. These carried large supplies of hoses, each having approximately 1 800 meters of Types B and C pressure hoses besides reserve suction hoses.

Power Ladders Type KL 2 6. The ladders were oil-pressure operated, the pressure used being 70 pounds per square inch (5 atmosphere). Each such ladder could be extended to a total length of 31 meters.

Repair Trucks. These carried along all light and heavy items of equipment which might be needed in fire control or other major damage control operations. This included blasting equipment, chain and other pulley blocks, tripods, acetylene cutters, electricity generator units, power saws, drilling machinery, sledge hammers (Boschhammer), and innumerable other minor items.

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According to the new tables of organization established in 1942, each motorized passive air defense battalion was authorized the following personnel and vehicles:

- 37 officers (including medical officers)
- 1 administrative inspector
- 82 noncommissioned officers
- 489 enlisted men
- 42 passenger cars
- 22 trucks
- 73 special type technical vehicles
- 5 field kitchens
- 24 motorcycles

making a total of 609 personnel and 169 vehicles.

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Equipment catalogs and loading schedules were established for power pumps, hose trucks, power ladders, personnel carriers, vehicles of the repair services, workshop trucks, and decontamination equipment trucks, and were published as Air Force Field Manual L. Dv. 783, with annexes 1-15.

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Initially no provisions were made to arm personnel of motorized safety and auxiliary battalions, but the need to do so became evident during their first commitment in the zone of military operations. From then on these battalions had small arms and machine guns, and were thus armed in a manner similar to units of the Air Force ground organization.

The continuously repeated recommendation to provide the

423. Appendix A.

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312 battalions with light anti-aircraft guns produced no results, although serious losses were incurred frequently in personnel and materiel when the battalions came under low level air attacks.⁴²⁴

The missions which developed for the battalions in their assigned areas were exceptionally diversified.⁴²⁵ Personnel were subjected to exceedingly difficult conditions of action. After their approach route, which was usually long, personnel had to go into action immediately for long periods without interruption under conditions of smoke, steam, and excessive heat. This was not only the case in firefighting operations, but also in action to rescue persons buried alive or to evacuate the inmates of air raid shelters from areas threatened by large area fires. Exposed continuously not only to the hazards of air attack, but also to those of delayed action bombs, of poisonous gases and fluids emanating from burning chemical products, and to the psychological impact of the frequently horrible appearance of men, women, and children who had been killed, each man, usually unknown and unnamed, battled to accomplish the mission of rescuing and/or preserving human life and property. Numerous losses were incurred, but unfortunately

424. See also Die LS-Abteilungen (mot.) der Luftwaffe im 2. Weltkrieg, Hans Worringer, 1956.

425. Karlsruhe Document Collection: Der Kampf der LS-Verbände im Schadensgebiet, Hans Worringer, 1956.

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313 there is no possibility to enumerate them in detail.

Great demands were also made on the commissioned and non-commissioned personnel in the battalions. Great difficulties were encountered already in the transmission of orders, in the proper assignment of units in city areas covered with debris and clouds of smoke, and in the maintenance of cooperation with adjacent passive air defense battalions. The necessity to be able to cope with quickly changing situations called for a marked ability to size up a situation quickly and to make quick decisions. It is no simple matter to "wheel about" a passive air defense unit in action with enormous lengths of hose unwound and in use. Furthermore, the matter of supplying units committed in large damage control areas as a rule presented very serious problems.

The types of vehicles and items of equipment in use in the battalions were developed by the appropriate specialized departments in the Office of the Reich Minister for Aviation and Commander in Chief of the Air Force, and were modified and improved constantly in line with the latest experience. One piece of equipment which proved of particular significance was the Type 15 Firefighter-Tanker Truck. Able to operate independently of outside water supplies, this fire engine could be used in quick action to localize numerous small fires

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313 and thus prevent their spreading to develop into large area fires. In the future it would appear wise to assign passive air defense units larger numbers of these fire engines than was the case in World War II.

The German passive air defense forces were not adequately equipped with radio. Speedy action and the prevention of any delays at the pilot stations are the essential conditions for success. Because of the terrific speed at which fires sometimes spread, every minute counts. The possibility must be taken into account that wire communications might be interrupted at any time. The use of aircraft for the direction of passive air defense operations will be dealt with later in this

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study.

Under the German system the resupply of special type vehicles and other equipment for passive air defense was handled
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through the Air Force equipment depots.

Developments in the air situation created the necessity for the motorized passive air defense battalions to change their stations frequently, and this also involved changes in the chain of command. Command control over any one of the battalions could change at any moment from one passive air defense regiment to another, or a battalion could be committed in

426. ~~XXXXXXXXXX~~ See III, c, 2, above.

427. See VII, below.

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314 independent action.

Each battalion was stationed in proximity to some defense target, and was required to familiarize itself thoroughly with the specific features of structure and layout of that target, so that it could take immediate action in the event of an air attack. In other cases the battalion received its operational orders from the appropriate air district command headquarters.

In the matter of the organization and equipment of a passive air defense battalion (motorized) widely varying recommendations for improvement were submitted on the basis of operational experience.

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One recommendation was that the assignment of a special repair company (the 3d Company) should be discontinued, and that each of the battalions three companies should be uniformly equipped with firefighting, repair, and rescue and salvage items. In other cases retention of the organization as it existed is recommended with certain modifications of a technical-organizational nature, while yet other recommendations suggested that units of the motorized passive air defense forces should be organized on the same pattern as units of the firefighting police. The latter recommendation, if adopted,

428. Karlsruhe Document Collection: Luftschutz-Flurwehr, Oberleutnant Sulzbach, Footnote 114; also Die Luftschutz-Brigade Nr. 1, by Generalmajor Teschner in Ziviler Luftschutz, Volume 1/1956, Verlag Gesschutz und Luftschutz, Kollenz, a photostat copy of which is included with this study as Appendix 15.

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314 would have insured uniformity in the organization of the units of these two forces, which are usually employed simultaneously, and uniform unit effectiveness, which would have simplified command control.

315 The idea of conforming to the pattern of the firefighting police in any future organization of passive air defense units is sound. However, it would be necessary to establish from the outset the extent to which the fire fighting police forces could cope with the missions of rescuing buried persons and of carrying out temporary repairs in addition to their other functions, a problem which exceeds the scope of this study.

Although it appears unlikely that chemical weapons will be used in the future, it nevertheless appears necessary to maintain a decontamination service, although on a reduced scale, within the mobile passive air defense units. The existence of personnel with training in this subject and equipped with the necessary protective clothing proved extremely valuable in damage control action in chemical works, oil works, and in operations to salvage dangerous chemicals.

A medical service is definitely essential, but opinions vary on its scope. One point is clear, namely, that in addition to taking care of unit personnel, the service must be

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able to aid members of the civilian population in a stricken area while the unit is in action there.

It is recommended generally that motorized passive air defense battalions should have more special type vehicles and specialized items of equipment. Thus, as early as after the first large scale attacks against Hamburg in 1943, the demand was raised for increased equipment with Type TLF 15 Tanker-Fire Engines, and for armored caterpillar rescue vehicles. ⁴³⁰

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The development of special type vehicles will play an important role in the future. On the one hand it will be necessary to transport the necessary servicing personnel on their equipment vehicles, in preference to moving them up in special personnel carriers; on the other hand the vehicles must at least to some extent be capable of all-terrain travel. It is to be assumed that the problem of debris-blocked roads, which cannot be cleared with the necessary speed, will assume larger proportions than in the past.

In addition to the above, each sizable unit must have heavy road clearing machinery capable of ploughing an emergency route over or through mounds of rubble and debris. It would be impossible to allocate firefighting units with a full sufficiency of hoses and quick coupling pipes. Under the German system each motorized passive air defense battalion had

⁴²⁹. Footnote 306, above.

⁴³⁰. Footnote 441, below.

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316 approximately 3 300 yards (3 kilometers) of quick-coupling pipes. Planning for operations by mobile passive air defense units must be based on the ability to operate on independent water supplies.

Very special importance attached and still attaches to the equipment of passive air defense units ^{with} foam fire extinguishing equipment. Particularly in action against oil fires wide experience was gained and considerable success was achieved

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ed with such equipment.

Under the German system it was customary to consolidate a number of motorized passive air defense battalions within an air district command area under a passive air defense regiment headquarters. Besides directing and controlling the operations of their battalions, the regimental commanders were responsible for such matters as troop discipline and administration. Great difficulties were encountered in the field of the administrative and disciplinary control of the units, which were assigned directly under the air district commands and frequently had to change their stations, including movements into outside air districts, as the current air situation required. The appropriate staff sections (Gruppenleiter Ia op 3) of the air district commands did their utmost to maintain and improve the effectiveness of their motorized passive

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317 air defense battalions. Having no service command authority, however, they were not always able to put their desires and recommendations into effect, so that deficiencies became apparent, particularly when battalions were transferred to other air district commands, and even more so when units were dispatched to operate in the zones of army operations in the east-

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ern theater. Recommendations to establish special passive air defense staff sections (Hoshers LS-Fuehrer) at air fleet headquarters, and passive air defense sections (LS-Fuehrer) at air district commands, following the pattern of the Air Signal Corps, produced no results.

In all cases where passive air defense regiment headquarters were established, the regimental commanders were able to take action in the fields of service control and discipline, which improved the effectiveness of their units.

For more information on organization and chains of command in the motorized passive air defense forces the reader is referred to the next section of the present study.

A passive air defense brigade headquarters was established in only one case, in Rumania. More details on this brigade will be found on page 441, below, and more details on its activities and performances in Chapter III, f, above. ⁴³³

432. III, d, above.

433. See III, f, above.

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In addition to all other controls, the Inspector of Passive Air Defense Forces, within the Passive Air Defense Operations Staff at the Air Force High Command, had the mission of visiting and inspecting the various units regularly, and was responsible for the uniform control and equipment. On the basis of his reports the Reich Minister for Aviation and Commander in Chief of the Air Force could take action to remedy defects which became apparent.

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2. Units of the Passive Air Defense Forces (Motorized).

At the beginning of the war only a small number of safety and auxiliary service motorized battalions were in existence. Even before incorporation of the service with the air force, the number of battalions was increased. Further activations after transfer to the Air Force brought the total up to

- 1 Passive air defense brigade
- 8 Passive air defense regimental headquarters
- 48 Motorized passive air defense battalions
- 2 passive air defense replacement battalions
- 1 passive air defense school
- 1 passive air defense instruction company (at the Reich Institute of the Air Force for Passive Air Defense).

The following is a brief survey of the status of the above units:

1st Passive Air Defense Brigade, Headquarters: Floesti, Rumania

5th Passive Air Defense Regiment

434. See Woerringen for more details on the individual units and important operations.

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1st Passive Air Defense Brigade--Continued:

8th Passive Air Defense Regiment
 Passive Air Defense Bomb Disposal Detachment
 1st Firefighting Police Regiment (tactically assigned)
 One smoke battalion
 One special purposes passive air defense battalion.

1st Passive Air Defense Regiment, Headquarters: Saar.

Five passive air defense battalions (14th, 19th, 22d,
 23d, 25th, 26th, and 27th).

2d Passive Air Defense Regiment, Headquarters Hamburg-Blanken-
 esse.

A number of frequently changing motorized passive air de-
 fense battalions. A report submitted by the officer com-
 manding the regiment at the time and dealing with opera-
 tions on the occasion of the large-scale attacks against
 Hamburg typifies the command control activities by the
 regimental headquarters.
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3d Passive Air Defense Regiment, Headquarters Berlin--trans-
 ferred in February 1945 to Ludwigsburg/Mecklenburg.

A very frequently changing number of motorized passive
 air defense battalions.

4th Passive Air Defense Regiment, Headquarters: Etampes near
 Paris, trans-
 ferred in August 1944 to Merseburg and later to Burg Saaleck.

A frequently changing number of motorized passive air
 defense battalions.

5th Passive Air Defense Regiment, Headquarters: Flocsti,
 Rumania.

27th Passive Air Defense Battalion
 30th " " " "

435. Footnote 441, below.

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5th Passive Air Defense Regiment--Continued:

41st Passive Air Defense Battalion.

6th Passive Air Defense Regiment, Headquarters in 1942 in Operational Zones of the Eastern Theater; from 5 June 1943 at Darmstadt.

Status 1942 :

16th Motorized Passive Air Defense Battalion

42d " " " " "

Status after June 1943:

25th Passive Air Defense Battalion

33d " " " "

37th " " " "

22d " " " "

49th " " " "

7th Passive Air Defense Regiment, Headquarters: Munich up to autumn 1944, then Neulengbach near Vienna.

Status prior to autumn 1944:

26th Passive Air Defense Battalion (Motorized)

38th " " " " "

44th " " " " "

Later status:

17th Motorized Passive Air Defense Battalion

36th " " " " "

43d " " " " "

8th Passive Air Defense Regiment, Headquarters: Campina, Rumania; transferred in October 1944 to Heydebreck, Upper Silesia.

Status in Rumania:

45th Passive Air Defense Battalion (Motorized)

46th " " " " "

47th " " " " "

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1st Passive Air Defense Replacement Battalion, Headquarters: Wurzen.

2d Passive Air Defense replacement Battalion, Headquarters: Bonn-Venusberg; transferred in September 1944 to Wurzen.

Passive Air Defense School, Garrison: Wurzen; transferred in September 1943 to Bonn-Venusberg and in September 1944 to Wurzen.

11th Motorized Passive Air Defense Battalion (Organic to 2d Passive Air Defense Regiment).

Activated at Stettin in January 1940

Garrison: Stettin; transferred to Magdeburg in May 1940, and to Varel in October 1940.

12th Passive Air Defense Battalion (from 1942 on under 2d Passive Air Defense Regiment).

Activated at Berlin in January 1940

Garrison: Berlin; transferred in June 1942 to Bremen-Vegesack.

13th Passive Air Defense Battalion (Motorized), (Organic to 3d Passive Air Defense Regiment).

Activated at Merseburg in late 1939;

Garrison: Merseburg; transferred in January 1943 to Halle, in January 1945 to Berlin-Spandau.

14th Motorized Passive Air Defense Battalion, under 5th, later 1st Passive Air Regiment.

Activated at Leipzig in late 1939

Garrison: Muenster; transferred in autumn 1943 to Essen-Kray, later to Osnabrueck.

15th Motorized Passive Air Defense Battalion.

Activated at Jena in December 1939

Garrison: Jena; transferred to western theater in May 1940; committed as a combat force from 1944 on.

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16th Motorized Passive Air Defense Battalion (under 3d Special Purposes and later 3d Passive Air Defense Regiment).

Activated at Koenigsberg, Eastern Prussia, in 1940.

Garrison: Koenigsberg; later at Maikop in Russia and Oeschatz in Saxony.

17th Passive Air Defense Battalion (Motorized), (under 1st, later 7th Passive Air Defense Regiment).

Activated at Dortmund in 1940.

Garrison: Dortmund, later Zistersdorf in Austria.

18th Motorized Passive Air Defense Battalion, (successively under 1st, 3d, 1st, 6th Passive Air Defense Regiments).

Activated at Bonn.

Garrison: Cologne; transferred to Berlin in November 1943, back to Cologne in April 1944, to Offenburg/Baden in July 1944.

19th Passive Air Defense Battalion (Motorized), (under 1st Passive Air Defense Regiment).

Activated at Bonn-Rangelar in 1942.

Garrison: Muehlheim/Ruhr Region up to January 1943.

20th Motorized Passive Air Defense Battalion.

Garrison: Essen-Krey; transferred in August 1943 to Muenster.

21st Motorized Passive Air Defense Battalion, (under 2d Passive Air Defense Regiment)

Activated at Hamburg in 1941.

Garrison: Hamburg-Wentorf.

22d Motorized Passive Air Defense Battalion, (under 1st Passive Air Defense Regiment).

Activated at Muenster in later 1939.

Garrison: Muenster; transferred to Nuremburg-Zirndorf in April 1942.

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321 23rd Motorized Passive Air Defense Battalion, (under 1st Passive Air Defense Regiment), later under Air District Command Belgium-Northern France, later reverted to 1st Regiment)

Activated at Dortmund in late 1939.

Garrison: Successively at Dortmund; Unna; Schwerin; Western Theater, up to 1943, then successively at Dorsten, Gelsenkirchen, Essen, and Herbede.

24th Motorized Passive Air Defense Battalion, (under 1st Passive Air Defense Regiment).

Activated at Lenkerbeck, Ruhr Region, in 1940.

Garrison: Dortmund-Marten.

25th Motorized Passive Air Defense Battalion (under 1st, later 6th Passive Air Defense Regiment).

Activated at Essen in 1939.

Garrison: Successively at Essen, Mannheim-Kaefertal,
436
Weinheim/Bergstrasse, and Holzkirchen bei Muenchen

322 26th Motorized Passive Air Defense Battalion, (under 1st, later 5th Passive Air Defense Regiment).

Activated at Duesseldorf in 1939.

Garrison: Successively at Hilden bei Duesseldorf, Cassel, and Munich.

27th Motorized Passive Air Defense Battalion, (under 1st, later 5th Passive Air Defense Regiment).

Activated at Cologne in 1939.

Garrison: Successively at Cologne, Cassel, Floesti/Rumania, (there from 1943 till defenses collapsed in 1944).

29th Motorized Passive Air Defense Battalion.

Activated at Herke bei Jever, Oldenburg, in 1942.

<u>Under</u>	<u>Stationed at</u>
2d Passive Air Defense Regiment	Wismar
1st " " " "	Essen-Kray

436. Unfortunately no records have been uncovered on motorized passive air defense battalions missing in the above tabulation.

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29th Motorized Passive Air Defense Battalion--Continued

<u>Under</u>	<u>Stationed at</u>
2d Passive Air Defense Regiment	Greifswald
3d " " " "	Berlin-Gatow
1st " " " "	Dortmund, later Cassel
2d " " " "	Stettin
3d " " " "	Berlin-Doeberitz
1st " " " "	Dortmund

30th Motorized Passive Air Defense Battalion.

Activated at Dresden early in 1941.

Garrison: Dresden up to 1941. Then under 5th Passive Air Defense Regiment at Campina, Rumania.

31st Motorized Passive Air Defense Battalion.

Activated at Frankfurt on Main in 1940.

Garrison: In western theater under Air District Command Belgium-Northern France; then at Nuremburg under 6th Passive Air Defense Regiment.

32d Motorized Passive Air Defense Battalion.

Garrison: Darmstadt under Air District Command XII; then in Western theater under Air District Command Western France; later at Hanover under 2d Passive Air Defense Regiment.

33d Motorized Passive Air Defense Battalion.

Activated at Bensheim/Bergstrasse in 1939.

Garrison: Western Theater under Air District Command Western France; transferred to Darmstadt in 1941 under 6th Passive Air Defense Regiment; then to Eastern Theater (Hungary and later Upper Silesia).

34th Motorized Passive Air Defense Battalion.

Activated at Nuremburg in 1940.

Garrison: Nuremburg until May 1940 under Air District Command VII; then in Western Theater under Air District Command Paris, later 4th Passive Air defense Regiment;

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34th Motorized Passive Air Defense Battalion--Continued:

finally at Berlin from 1943-45 under 3d Passive Air Defense Regiment.

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35th Motorized Passive Air Defense Battalion.36th Motorized Passive Air Defense Battalion.

Activated at Munich in 1939-40.

Garrison: Kaiserslautern up to April 1940 under Air District Command VII; in Western Theater up to January 1941 under Air District Command Western France; at Floesti/Rumania under 5th Passive Air Defense Regiment until defenses collapsed there.

37th Motorized Passive Air Defense Battalion.

Activated at Kaiserslautern in 1941.

Garrison: Kaiserslautern, later Forbach, under 6th Passive Air Defense Regiment.

38th Motorized Passive Air Defense Battalion.

Activated at Augsburg in 1942.

Garrison: Augsburg-Gattlingen under 7th Passive Air Defense Regiment.

39th Motorized Passive Air Defense Battalion.

Activated at Guetersloh in 1941.

Garrison: Guetersloh under 1st Passive Air Defense Regiment.

40th Motorized Passive Air Defense Battalion.

Activated at Berlin in 1942.

Garrison: Berlin-Bernau under 3d Passive Air Defense Regiment.

41st Motorized Passive Air Defense Battalion.

Activated at Vienna in 1940.

Garrison: Konstanz, Black Sea, under 5th Passive Air Defense Regiment; then under Air District Command I

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437. It has not been possible to uncover records giving the information missing in the above tabulation.

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41st Motorized Passive Air Defense Battalion--Continued:

temporarily at Praust bei Danzig for rehabilitation;
finally from early 1943 on at Paulesti near Floesti/Ru-
mania.

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42d Motorized Passive Air Defense Battalion.

Activated at Vienna in 1940.

Garrison: Vienna under Air District Command VII; transferr-
ed to Floesti/Rumania under 5th Passive Air Defense Regi-
ment in spring 1941; to Russian theater in March 1942; to
Fruetzke, near Brandenburg, in April 1943, under 3d Pas-
sive Air Defense Regiment.

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43d Motorized Passive Air Defense Battalion44th Motorized Passive Air Defense Battalion.

Activated at Ingolstadt in 1943.

Garrison: Rain on Lech, near Ingolstadt under 7th and from
1944 on under 6th Passive Air Defense Regiment.

45th Motorized Passive Air Defense Battalion .

Activated at Moreni/Rumania in 1944.

Garrison: Moreni, near Floesti under 8th Passive Air
Defense Regiment.

46th Motorized Passive Air Defense Battalion.

Activated at Campina/Rumania in 1944.

Garrison: Campina under 8th Passive Air Defense Regiment.

47th Motorized Passive Air Defense Battalion.

Activated at Konstanz/Rumania in 1944.

Garrison: Konstanz under 8th Passive Air Defense Regiment.

48th Motorized Passive Air Defense Battalion.

Activated at Dessau in 1943.

Garrison: Magdeburg under 3d Passive Air Defense Regiment;
from/A August 1944 to February 1945 under 4th Passive Air
Defense Regiment.

~~49th~~
438. See Footnote 437, above.

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324 49th Motorized Passive Air Defense Battalion.

Activated at Vienna in 1944.

Garrison: Saarbruecken under 6th Passive Air Defense Regiment.

50th and 51st Motorized Passive Air Defense Battalions.

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52d Motorized Passive Air Defense Battalion.

Activated at Duisburg in 1944.

Garrison: Successively at Duisburg under 1st, and Kattowitz (Katowice) under 8th Passive Air Defense Regiment; Breslau under Fortress Commander.

53d Motorized Passive Air Defense Battalion.

Activated at Hamburg in 1944.

Garrison: Bruex, Czechoslovakia, under Air District Command VIII.

54th Motorized Passive Air Defense Battalion.

Activated at Dortmund in 1944.

Garrison: Dortmund under 1st Passive Air Defense Regiment.

58th Motorized Passive Air Defense Battalion.

Activated at Aschersleben in 1944.

Garrison: Aschersleben under 3d Passive Air Defense Regiment.

A brief review of the numerous and usually exceedingly difficult missions of the above battalions, and of their performances, experience, and ultimate fate, insofar as such information is available, will be found in the previously mentioned appendix Die LS-Abteilungen (mot.) der Luftwaffe im 439. See Footnote 437.

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451 440

2. Weltkrieg, by Hans Woerringen.

A detailed description of the operations of the 2d Passive Air Defense Regiment during the large-scale attacks against Hamburg will be found in a report submitted by the officer commanding the regiment at that time and dated 17

441

August 1943. The report includes an analysis of the experience gained and recommendations for improvement, and can be considered as a typical example of such reports, and as an example of the command and operations of passive air defense regiments in general.

442

3. The Commitment of Passive Air Defense Forces outside of the Zone of Interior.

443

aa. In the Western Theater. At the beginning of the 1940 campaign in the west, the units later known as motorized passive air defense battalions were still designated motorized security and auxiliary services battalions. Five such battalions followed up in the immediate rear of the fighting forces to execute special missions. After the campaign was over these battalions for the time being remained in the occupied western territories. The following units were involved:

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440. See Footnote 420, above.

441. Karlsruhe Document Collection: "Terrorangriffe auf das Stadtgebiet Hamburg in der Zeit von 25.7.-3.8.1943," report by 2d Passive Air Defense Regiment dated 17 Aug 43.

442. More details will be found in Appendix 28: "Einsatz Ger-Continued.

325

The 15th Motorized Safety and Auxiliary Services Battalion

activated at Jena, was assigned under Air District Command Belgium-Northern France. With headquarters at Meysse, near Brussels, its mission was to protect the coastal areas along the English Channel from Antwerp to Rouen.

The 32d Safety and Auxiliary Services Battalion (Motorized)

activated at Mainz was assigned under Air District Command Western France. With headquarters at Rennes, its mission was to protect the areas of Normandy, certain areas of Brittany, and the coastal areas as far as the mouth of the Loire River.

The 33d Motorized Safety and Auxiliary Services Battalion,

activated at Mannheim, was assigned the adjacent/coastal area, extending from St. Nazaire to the mouth of the Gironde River, with headquarters at St. Florent le Viel.

The 36th Motorized Safety and Auxiliary Services Battalion

activated at Karlsruhe, was assigned responsibility for the rest of the coastal area from the mouth of the Gironde River to the Spanish frontier, with headquarters at Bordeaux.

The 34th Motorized Safety and Auxiliary Services Battalion

activated at Nuremberg, was assigned initially to the air Fleet reserve and stationed at Charenton, near Paris. However, the air situation at the coast soon necessitated its transfer.

442--Continued: Luftschutzverbände im 2. Weltkrieg im Operationsgebiet, by Major Hans Worringer, 1956

443. See Appendix 28, pp. 1 ff., and picture series.

444. For details on missions and performances see also III, d, above.

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326

Its 1st Company was dispatched to Brest, its 2d to Lorient, and its 3d to Cherbourg.

Even as early as in 1940, the demands made on all of the above units were exceedingly severe, and in selfless devotion to duty all commissioned and noncommissioned officers and men did their utmost to meet these demands. The battalions were assigned under the several air district commands and maintained close contact with the military government area headquarters of their respective areas. Each of these headquarters had a special ~~XXXXXXXXXXXX~~ civilian air defense liaison officer on its staff. Concurrently with their operational missions, the battalion commanders had instructions to supervise the precautionary passive air defense measures taken within their protective areas.

445

The air situation quietened considerably at the end of 1940, and already at the beginning of 1941 the first Safety and Auxiliary Services Battalions were transferred back to the Zone of Interior. The last to return was the 34th, meanwhile redesignated as the 34th Motorized Passive Air Defense Battalion, which was reassigned in the Berlin area.

446

bb. In Rumania. The first motorized passive air

445. See III, e, above, and Appendix 15: Report by Major Teschner.

446. See III, f, above, and Appendix 28, pp. 6 ff.

454

327 units assigned to protect the oil fields and oil refineries in the Ploesti area were dispatched to Rumania late in 1941.

The 42d Motorized Passive Air Defense Battalion, activated at Vienna, initially assumed responsibility for the oil producing and processing works around Ploesti. Because of the urgent need for additional forces, a regimental headquarters, the 5th Passive Air Defense Regiment, was activated at headquarters of the 1st Passive Air Defense Replacement Battalion, Wurzen, and dispatched to Rumania, together with the following units; under its control:

30th Motorized Passive Air Defense Battalion, with headquarters at Campina;

27th Motorized Passive Air Defense Battalion, with headquarters at Ploesti;

41st Motorized Passive Air Defense Battalion, with headquarters at Paulesti, north of Ploesti;

42d Motorized Passive Air Defense Battalion, with headquarters at Ploesti.

Further reinforcements became necessary after the US Air Forces commenced penetrating to the oil regions of Rumania. In order to insure uniform damage control action a brigade headquarters, the 1st Passive Air Defense Brigade, was established in Ploesti in 1943 and given ^{tactical} control over all passive air defense forces in the country, including the Rumanian fire fighting forces. Another passive air defense regiment was

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327 activated at the same time, namely, the 8th Special Purposes Passive Air Defense Regiment, with headquarters at Campina. This regiment in March 1944 controlled three motorized passive air defense battalions; the 45th, with headquarters at Moreni; the 46th, with headquarters at Campina; and the 47th, with headquarters at Konstanza.

328 However, these three battalions were not fully effective: each of them contained one German cadre company, while its other two companies were made up of untrained Rumanian personnel.

Unfortunately, approval was not granted to the recommendations to return all passive air defense units, which were not suitable for ground combat missions, to the Zone of Interior in time for more important missions. The majority of the units were therefore captured. Only the headquarters staff of the 8th Special Purposes Passive Air Defense regiment, together with one of the regiment's cadre companies, and small elements from some of the battalions succeeded in escaping envelopment and reestablishing contact with the withdrawing German front.

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cc. In Russia. Headquarters, 3d Special Purposes Passive Air Defense Regiment was activated in 1942 for the express purpose of protecting oil regions in territories it was
447. For more details see Appendix 28, pp. 13 ff.

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328 hoped German ground forces would occupy. For this mission the regiment received the 16th Motorized Passive Air Defense Battalion, from Koenigstein; and the 42d Motorized Passive Air Defense Battalion, from Vienna and currently deployed in Rumania.

The regiment was assigned under Air District Command Dnepropetrovsk, and was under tactical control by the Mineral Oil Brigade (Brigade Mineraloel). In addition to the normal missions of all passive air defense units following the advancing army forces, the regiment had the specific mission of restoring to operability the oil pumping stations and oil storage installations along the oil pipelines leading from Baku and Batum.

329 After the German advance came to a halt in the summer of 1942, the regiment's two battalions remained at Maikop and Krasnodar, respectively, each of them releasing one company for the activation of a new unit, Motorized Passive Air Defense Battalion Pyatigorsk, which assumed responsibility for the protection of five separate stations.

To enable them to cope with their manifold duties, all passive air defense units were reinforced by Russian personnel. Recruited partly from prisoners of war and partly from volunteer civilians, these supplementary personnel rendered excellent services.

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Unfortunately, the units were not appropriately equipped to cope with the specific conditions encountered in the Eastern Theater; this applies to the lack of standardization in the vehicles assigned and, what was particularly fateful, to the lack of the essential weapons. It would be beside the point to examine in this study the question of who was responsible for these deficiencies. Another serious factor was the fact that developments in the tactical situation made it necessary to organize the personnel, most of whom were at an advanced age, into replacement companies and employ them in ground combat, in which they nevertheless gave a good account of themselves.

During the German withdrawals in December 1942, Passive Air Defense Battalion Pyatigorsk was successfully evacuated in time. The 16th and 42d Battalions succeeded in reaching Rostov, some of their units crossing the ice covered Sea of Asov to its northern shores, although they did lose some of their heavy vehicles, which broke through the ice.

Experience in these operations made it clearly obvious that passive air defense units intended for employment in operational zones or in any insecure areas definitely must be able to meet all requirements of combat, both in respect to their equipment with weapons and in respect to their combat training.

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4. The Training of Motorized Passive Air Defense

Troops. Whereas noncommissioned officer and other enlisted personnel could receive functional training, with the exception of special courses, within the units, new ways and means had to be found for the training of officer personnel. As mentioned previously, it was exceptionally difficult to obtain suitable officer replacements for the passive air defense arm. In addition to being a fully qualified leader of troops, the passive air defense officer within a relatively short time had to absorb a large measure of specialized technical knowledge. In addition he had to receive training in the special features of command and tactics in a hitherto completely foreign special service branch.

The 1st Passive Air Defense Replacement Battalion at Würzen received instructions to establish a passive air defense school. The purpose here was to retrain officers transferred to the service from other branches of the Air Force or from the Army, and to familiarize them with the principles and tactics of firefighting, of salvage and rescue operations, and of damage control action in general.

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The school went into operation on 8 September 1942. Courses were conducted in a quick succession, and it was found that roughly 50 percent of the participants were able to qualify

448. Karlsruhe Document Collection: "Die Luftschutzschule fuer die Luftschutztruppen," by Hans Worringer, 1956.

330 for assignment to the Passive Air Defense Army

Regulations were still lacking for training purposes, and these the Passive Air Defense School proceeded to compile in accordance with the needs revealed by practical experience, and to apply in future training.

A Training Company had been activated in the meantime with the special mission of improving the standards of infantry training within the passive air defense battalions in addition to specifically functional training. In the past, infantry training had been intentionally neglected, but now that it was to be assumed that battalions would be committed in the operational zones of the Eastern Theater, it became essential to place emphasis on training in this subject.

From then on continuing courses were conducted for company commanders and platoon leaders from the passive air defense motorized battalions, the object being to insure uniform application of the training regulations.

In the case of large-scale attacks against targets in the northern and central territories of Germany, the entire Passive Air Defense Replacement Battalion was frequently committed. As a rule the Training Company and the participants in current courses also participated in these operations.

Special mention is due here of the commitment of the

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331 Replacement Battalion during the large-scale attacks against Hamburg in July 1943, in which the battalion suffered heavy losses.

The steadily increasing severity of the air situation necessitated a considerable reinforcement of the passive air defense arm. The activation of new motorized passive air defense battalions, smoke battalions, ^{and} special purposes passive air battalions to operate dummy installations, led to creation of the 2d Passive Air Defense Replacement Battalion, with headquarters in the AAA Caserne at Bonn-Venusberg. The Passive Air Defense School was attached to this new battalion, where it had adequate space for its expanded training ^{activities.} ~~program.~~ The instructor staff was increased, ⁴⁴⁹ and the training programs were adapted currently to the latest experience. ⁴⁵⁰ Special courses were also conducted, for example, in the subjects of bomb disposal and decontamination.

When the German front in the west was forced back, the 2d Passive Air Defense Replacement Battalion was transferred rearward to Wurzen together with the Passive Air Defense School, a movement which took place between 17-23 September 1944. Systematic training activities ceased in February 1945.

The following regulations were applicable in the training ⁴⁵¹ of passive air defense forces:

451. The following tabulation is not complete. It has not been possible prior to writing to establish the missing items.

461

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Air Force Field

Title

Manual L. Dv. #

752	Training Regulations for Passive Air Defense Units (<u>Ausbildungsvorschriften Iuer Luftschutzeinheiten</u>).
752/1	Training in the Firefighting Service (<u>Ausbildung im Feuerlöschdienst</u>).
752/1a	Vehicles and Equipment (<u>Fahrzeug- und Gerätekunde</u>).
752/1b	Individual Training (<u>Sinzelausbildung</u>).
752/3	Repair Service Training (<u>Ausbildung im Instandsetzungsdienst</u>).
752/3b	Construction, Supporting, and Reinforcing (<u>Baukunde, Abstützen und Absteifen</u>).
752/3c	Blasting and Bomb Disposal (<u>Sprengen</u>).
752/3d	Rubble Clearance and the Rescue of Buried Persons (<u>Beseitigung von Trümmern und Bergen Verschütteter</u>).

449. See Footnote 448; Appendix 1.

450. See Footnote 448; Appendix 2.

5. Command Principles for Passive Air Defense Forces.

In passive air defense, organization and operational command are two distinctly separate missions. Whereas the organization involves long-range activities in which all pros and cons of a measure must be examined in cooperation with all interested agencies, operational command requires quick decisions and a complete mastery of the whole command apparatus.⁴⁵² As a rule the person responsible for the organization will not be identical with the person in operational command: the requirements in the two fields differ too widely, and in a certain sense can even be described as contradictory. During operations organizational activities recede into the background, the only decisive factors being a quick grasp of the current situation and the proper commitment of the available forces.

The command principles were worked out prior to the war in passive air defense field exercises, CP exercises, and map games, and it can be stated here that the principles formulated by the Office of the Commander in Chief of the Air Force/Passive Air Defense Operations Staff in Air Field Manual L. Dv. 751 represented a proper appraisal of coming developments. Taking these regulations as a starting point, principles governing the command of the passive air defense forces were developed. Initially, these principles were restricted

452. See highly interesting passages in "Fachrang im Luftschutz," by Generalleutnant Haenschke, Bonn, in "Ziviler Luftschutz" Volume 2, February 1955.

333 intentionally to the command of a motorized passive air defense battalion.⁴⁵³

The principles thus formulated in Air Field Manual L. Dv. 751/2 Command of a Passive Air Defense Battalion (Motorized)--
Fuehrung einer Luftschutzabteilung (mot.) for the first time establish clear definitions of the units known as motorized passive air defense battalions, outline their missions as a command reserve, and regulate the chains of command by which they were to be controlled in the Zone of Interior and other territories.

The manual then deals with the following subjects:

The transfer of a motorized passive air defense battalion;
 The specific features involved in the road motor movement or rail movement of a motorized passive air defense battalion.

Operations, with emphasis on the commitment of forces by the unit commander, the use of pilot stations, orientation by the unit command with an orientation team, the mission assignment--usually by the local passive air defense chief and in exceptional cases assumption of on-the-spot tactical command by the unit commander in the damage control area, the issue of orders, cooperation, location of the command post and parking lots, the use of air spotters, specific damage control operations, and accelerated restoration to operability.

Billets and other premises.

Supplies.

453. Copy in Appendix 29. See also Karlsruhe Document Collection: L.Dv. 751/3 "Taktische Zeichen im Luftschutz."

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The principles thus established provided an outline for the conduct of operations by passive air defense regiments and independently operating battalions. If current developments in the air defense situation required, the appropriate officers in command of the air district commands issued supplementary or special regulation in addition. The following regulation issued by Air District Command VI is quoted as an example:

Commitment of Firefighting Forces.

At the Passive Air Defense pilot or guide stations the waiting time of units moving in from outside must be reduced to a minimum. Commissioned and noncommissioned officer personnel will be trained to take independent action. Particular care will be taken to insure that, during the unavoidable waiting period at pilot or assembly points, units will not remain inactive against developing fires until their operational orders arrive. With due consideration for the overall situation, unit commanders in such cases on their own decision will take quick and immediate action to commit firefighting teams. Requests by the population must not simply be rejected. If the unit's assigned mission excludes possibility to fulfill such requests the matter will be appropriately reported to higher echelons.⁴⁵⁵

454. See ~~VIII, XXIX, XXXI~~ III, 5, above.

455. Excerpt from "Besondere Anordnung fuer den Luftschutz Nr. 36" - ~~Act on~~ signed.

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The normal procedure would have been to first develop the principles governing the conduct of passive air defense operations and then build up the organization accordingly. In the past it proved possible to predict, with a relatively high degree of accuracy, coming developments in the air situation, although it was not always possible to translate appraisals into action in the organizational field with the necessary speed. As previously mentioned, the obstacles encountered were of an internal nature. The results were inescapable: the Passive Air Defense Branch, which had to have highly qualified personnel available, had to rely on personnel releases from other branches. These personnel were frequently unqualified, so that the whole service initially suffered from serious weaknesses and could only gradually be brought up to the necessary high standards of performance.

For the future it will be essential to establish speedily whether and in what scope military passive air defense units are to be activated to serve, in addition to the civilian passive air defense organization, more or less as passive air defense engineer units for special missions supplementary to the overall large-scale damage control operations. When employed at

455—Continued: issued by Air District Command on 23 October 1943.

335 damage control operations within military establishments or
336 military supply channels, such units would be under control by
the appropriate military authorities. If employed in operations
to protect the civilian population they should, as in the past,
in the case of the passive air defense troops, be placed under
the appropriate commanders of the civilian passive air defense
system. The time of locally circumscribed commitments is a
thing of the past in our age of atomic warfare. (It is essen-
tial to prevent growth of the idea that, as was the case with
gas in World War II, atomic weapons will not be used in any fu-
ture war).

Personnel in commands above the local level, and controll-
ing areas approximating those of the former commanders of regular
police, must be trained already during peace for their missions.
This applies also to mobile passive air defense command staffs,
such as those established and used successfully by some of the
commanders of regular police.⁴⁵⁶

Along the lines described above steps should be taken to
develop command principles for the direction of large-scale
operations by combined units, and to test them in plans cri-
tiques and map exercises.

456. See appendix quoted in Footnote 452: "Fuehrung im Luft-
schutz," pp. 13 ff.

b. Passive Air Defense Smoke Battalions.⁴⁵⁷

1. Organization. The following three types existed under the German system:

- Motorized smoke battalions
- Other mobile smoke units
- Stationary smoke units.

Each of the two motorized smoke battalions in existence was organized ⁱⁿ three companies of three 3-squad platoons. Insofar as tank cars or trucks were not available, the companies had the normal standard equipment, which consisted of smoke drums, each company having 54 smoke generators mounted on trucks, three to a truck. When necessary they could operate from their trucks.

Other mobile companies were partly motorized and were employed in accordance with the current air situation.

Stationary units were intended for permanent assignment to protect specific important targets. Their smoke generators were non-mobile and were placed in alternate positions to be operated in accordance with the current direction of the wind.

The total number of passive air defense smoke companies in existence was 98. Field manuals governing their operations were still in preparation when the war ended. In the meanwhile they operated in accordance with directives issued by the Reich Minister for Aviation and Commander in Chief of the Air

337 Force/Passive Air Defense Operations Staff or Air Inspectorate

13. These directives also governed the training of personnel at the smoke screening school established within the 1st Passive Air Defense Replacement Battalion.

The personnel assigned by the military recruiting offices comprised only men from the oldest age classes subject to the draft, so that it became necessary towards the end of the war to make use of volunteers or auxiliaries conscripted under the law regulating the confiscation of property or services for defense purposes.

The companies had no established tables of organization prescribing an authorized personnel strength. In each case the number of smoke generators assigned, and thus also the number of personnel required, was determined by the size and extent of the target to be protected.

Although former trials had produced negative results, women were employed again from 1944 on to service, and in some cases to operate, stationary smoke generators. When provided with the necessary working and protective clothing these women gave satisfactory service.

2. Smoke Generators. Besides captured tank cars or trucks two types of smoke-generating equipment were in use:

457. See VIII, d, 2, below, and Karlsruhe Document Collection: "Gliederung, Gerat und Einsatze der LS-Nebeltruppe," by Hans Worringer, 1956.

338 The drum or barrel smoke generator.

This apparatus consisted of three major parts, namely,

The barrel acid container, with roller hoops,

The compressed air cylinder, with accessories packed in portable "Pressure Gage Box."

The spray pipe, which emitted the smoke acid after it had been atomized in the atomizer nozzle.

Smoke Generator Type NB 80/2. This apparatus had been developed by the Reich Institute of the Air Force for Passive Air defense with support from the smoke arm and the Smoke Screening School. It was a much more handy piece of equipment than the drum or barrel smoke generator, but was similar in operation. Depending on the atomizer nozzle used, the air pressure applied, and the quantity of acid in the container, the smoke produced had a duration of between 2 hours 40 minutes and 4 hours 40 minutes. It could be operated from any control point by electrical remote control, with groups of each 20 generators functioning simultaneously and as frequently as desired.

3. Operations. Normally, smoke companies were assigned tactically under the antiaircraft artillery commander responsible at the target involved. In such cases defensive antiaircraft artillery fire was the primary mission, and smoke screening activities had to be coordinated, in accord-

338 accordance with current wind conditions, with the possibilities for effective antiaircraft fire.

In areas of concentrated smoke screening defense, smoke screening operations were the primary mission. Such areas had only light antiaircraft artillery units, tactically assigned under the local commander of smoke screening troops.

The 1st Motorized Passive Air Defense Smoke Battalion was first committed in Brest, France, and later at Ploesti, Rumania (see Footnote 457).

The first assignment of the 2d Motorized Passive Air Defense Battalion was in Norway. In the autumn of 1944 the battalion was redeployed in the Westwall area. Due to its high mobility and maneuverability, this battalion was able to cover all preparations for the Ardennes Offensive by smoke screening. The battalion also achieved success later in regrouping and troop unloading movements. Finally it was employed in the Magdeburg area and at the Bober River, Silesia.

The 98 other passive air defense smoke companies, some of them consolidated in battalions, were deployed in numerous and frequently changing missions. They were used primarily to protect the following categories of targets:

Coal hydrogenation plants

Chemical works

Other vitally important industrial works, particularly those producing commodities in short supply

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Installations of the electricity supply systems
 Port and harbor areas
 Ship building yards
 Proving and research stations and installations
 Traffic communication installations, such as
 Canals
 Railway bridges.

Preservation of the Brenner rail route, as the most important supply line for the German forces committed in Italy was due in some degree to the operations of the 8th Passive Air Defense Smoke Battalion. This battalion comprised three smoke companies ~~XXXXXXXXXX~~, the 95th, 96th, and 97th. Right up to the end of the war it succeeded in accomplishing its mission of protecting the Brenner Pass rail route with its innumerable viaducts, in particular the bridge across the Etsch River Valley.

Examples of areas of concentrated smoke screening operations were the Auschwitz and Dyhernfurth areas.

In the end the bottleneck in smoke producing acid supplies determined the scope and frequency of smoke screening operations, which towards the end of the war became increasingly important.

c. Special Purpose Passive Air Defense Battalions. As was the case with smoke screening operations, personnel from the Safety and Auxiliary Services (later Passive Air Defense Police) and from the Factory Air Defense System, plus Air Force construction units had to be used in the initial stages to operate

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340 dummy installations. When the construction and operation of dummy installations, and particularly large installations, assumed large proportions during the war and permanently assigned units became necessary for their operation, what were called "Special Purposes Passive Air Defense Companies" were activated for the purposes as part of the general passive air defense forces. These companies were assigned under the various air district commands and consisted of officers, noncommissioned officers and men who were only conditionally fit for military service. In air district command areas having a large number of important dummy installations, as was the case with Air District Command III, ⁴⁵⁸ these companies were consolidated to form Special Purposes Passive Air Defense Battalions.

Factory air defense personnel continued to service and operate small dummy installations of the various industrial concerns, but it was a basic policy to employ the new special companies to operate military dummy installations, for example dummy air fields, as well as the dummy installations at important armament factories and traffic centers, and large installations in general.

The air district commands allocated these forces by companies or in smaller elements to the various targets, where they were assigned under the antiaircraft artillery group or sub-group
comman

340 commander responsible for defense of the target or targets concerned, who had tactical and service control over them.

The missions of special purposes passive air defense units were of a highly diversified nature.⁴⁵⁹ In addition to continued development of the existing dummy installations, they were responsible for the structural maintenance of the various installations constructed for the purpose of deceiving hostile airmen. Their activities here included lighting effects, camouflage to conceal the target, and the servicing and operation of contraptions to simulate the continued spreading of fires, for which purpose they also had to insure that adequate fuel supplies were maintained.

Action was taken under orders from the antiaircraft artillery commander on the basis of reports on enemy air penetrations. In cases where no antiaircraft units were assigned, the company or other unit commander himself was responsible for initiation of the currently appropriate action.

The measures taken included the firing of deceptive signal rockets,⁴⁵⁹ the simulation of antiaircraft gun muzzle fire, the setting of simulated fires and the simulation of smoke from active fires, and the simulation of bomb explosions.

The personnel were billeted in cantonments situated in the neighborhood and well camouflaged. As a rule, dummy

458. Karlsruhe Document Collection: "Die SS-Truppe z.b.V.;" by Hans Worringer, 1956.

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340 installations were designed only for purposes of deception at night, and care had to be exercised to insure that they would not be detected from the air during daylight by reason of the installations themselves or by the presence of troop cantonments. Concrete structures were essential for command posts and for the operating stands.

Personnel in and for the companies received training in the 1st Passive Air Defense Replacement Battalion at Wurren.

It is essential for units of this type to have wireless signal communication equipment, since frequent interruptions of the wire networks would preclude proper control of the means employed.

In spite of grievous losses, the personnel in these units performed their duties loyally, although many of them were overage.

d. Bomb Disposal Details. While preparatory work for mobilization was proceeding, personnel in Air Inspectorate 13 within the Office of the Reich Minister for Aviation investigated the development of bombs abroad and made their findings available to the three branches of the military establishment for transmission to their bomb disposal squads. The technical personnel involved here were qualified in the engineering features of arms and ammunition, so that no difficulties were encountered. See VIII_a, 3, aa, bb, cc, below.

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342 encountered in training them in short courses on the disarming of foreign types of bombs. Training in this subject was considered a matter of secondary importance at the time, because the higher level command authorities thought it unlikely that large bombings of German territories would take place. Plans at the time provided for repair and salvage personnel of the Safety and Auxiliary Services to uncover unexploded bombs. A specialist was then to be sent for from the nearest military establishment to disarm the bomb.

This arrangement was retained during the war, and resulted already in 1940 in heavy casualties caused by the detonation of the first delayed action bombs.⁴⁶⁰ Personnel losses suffered by the Safety and Auxiliary Services in the exposed areas became increasingly intolerable, for which reason small specialized units were established to handle the removal of dud and delayed action bombs. The number of such units had to be increased later, particularly in the heavily attacked areas.

The units thus established were given the misleading designation of "Blasting Detachments (Sprengkommando). Their mission was less one of blasting than of disarming and removing bombs.

The personnel in these bomb disposal units received
460. See VIII, e, 1, 2, 3, below.

342 training in special courses conducted at the Air Force Technical School (Fliegerwaffentechnische Schule), Halle on the Saale. Particularly capable and qualified personnel of the Safety and Auxiliary Services were also detailed for participation in special courses, where they had the opportunity to qualify in the subject of disarming impact detonation bombs. Later in the war the school was transferred to Dresden-Nickern.

As a rule a bomb disposal squad consisted of one or two officers and 10-12 men. In the final phases of the war each air district command had available from two to four such squads

As the enemy continued the development of their ammunition for air delivery, the bomb disposal squads suddenly found themselves confronted with the fact that the techniques of mine warfare were being applied in land warfare. Each of the frequent innovations in the construction of enemy bombs created new problems for the squads. In each case it was inescapably essential to obtain possession of at least one of any new type of detonator in an undamaged condition. It is hard to conceive the silent heroism required to detach a detonator of unknown construction from a live bomb, an operation in which many a well trained bomb disposal technician has lost his life. It would be possible to compose a heroic epic on the devoted men of those days, on their courage and human greatness.

343 The bomb disposal squads suffered grievously heavy losses. Hardly one of the officers commanding the first such squads organized lived through the war. The chances were always 99 out of 100 that the bomb would explode while its delayed-action detonator was being removed, and the detonators became steadily more and more complicated. This work required a very especial gift, combined with keen intuition, and a certain measure of good luck to avoid an untimely detonation. Losses among the personnel of the Safety and Auxiliary Services (later Passive Air Defense Police) repair and salvage branch who had received training in the subject of bomb disposal also increased considerably.

With the growing frequency of air attacks the number of bomb disposal squads available was no longer adequate, although the various air district commands supported each other through temporary transfers of these units. It was thus unavoidable that the Passive Air Defense Police had to be called on with increasing frequency in urgent cases, and also with increasing frequency had to render supporting services.

Operations of the bomb disposal squads were governed by the regulations contained in Air Field Manual L. Dv. 764 and instruction sheets issued supplementary to that manual.⁴⁶¹

⁴⁶¹. Appendix 38 and Annex A: "Vorgehens der L. Dv.".

THE EMPLOYMENT OF CRIMINAL PRISONERS

Recommendations had long been submitted to employ criminal prisoners considered unworthy to bear arms and who volunteered for the purpose at digging out and uncovering dud bombs. These recommendations were only put into practice in 1941. After a period of familiarization the prisoners thus employed usually rendered good services. They were rewarded by a certain measure of freedom, good food, and rations of alcoholic beverages and tobacco, and in some cases their sentences were reduced. For these reasons volunteers were always available.

The rumor is naturally untrue that "specialists" such as professional burglars were used for the purpose because of their adeptness with their fingers. No criminal prisoner was permitted to touch the detonator of a bomb, even if it was of the simplest impact type. In all cases such prisoners were employed exclusively at digging in the presence of a bomb disposal specialist.

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VI. TRAINING.

Success in all passive air defense activities hinges upon the thorough training of all passive air defense personnel, extending from individual training for the rank and file to training for the higher echelons of command. It is necessary to differentiate here between

Functional technical training and
Command training.

The foundation in all cases was practical training, which culminated in a technical mastery of the equipment used and in proper passive air defense discipline in the use of such equipment.

Besides this it was important to give noncommissioned officer personnel training in the "tactical employment" of their "weapon"; meaning the proper commitment of their units, and in finding the most appropriate damage control methods to be applied in any of the widely varying sets of circumstances they were likely to encounter, and to exercise them in such activities.

(a) The decisively important requirement for smooth and above all quick action by large, numerous, and differing units and sub-units was proper training for the officers. The important point here was an ability to size up and appraise a situation quickly, development of the will to

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345 make personal decisions unhampered by administrative considerations, to estimate time requirements for transportation and march movements, while the subjects of supply and replacements also had to be kept in mind. On the civilian side an officer corps with training in these subjects existed only within the regular police. The requirement here now was to extend the training program to include instruction in the necessary technical services.

346 1 In this training map and field exercises played a large role. Right from the incipient stages of the civilian air defense system the Reich Minister for Aviation and Commander in Chief of the Air Force therefore took advantage of every possible opportunity to carry out passive air defenses exercises, whenever possible integrated with maneuvers of the military forces. This was the only possible way to train all forces in integrated action, to try out the command organization, and to prepare command personnel of all ranks and all branches for their missions, which became of greater scope and increasingly difficult as time passed. The following regulations were established, which were adapted continuously in line with the latest experience:

Air Field Manual L. Dv. 770: Regulations for Passive Air Defense Exercises (Bestimmungen fuer Luftschutzuebungen) Part I: Planning and Execution (Anlage und Durchfuehrung von Luftschutzuebungen).⁴⁶³

462. L. Dv. 770/1

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346 Air Field Manual L. Dv. 752: Training Regulations for Passive Air Defense Units (Ausbildungsvorschriften fuer die Luftschutzeinheiten) plus a number of annexes for the various specialized subjects involved.⁴⁶³

It was an especial necessity to establish uniform procedures for the various specialized subjects, since the specialist teams from the various passive air defense organizations (from the passive air defense troops, the passive air defense police, the firefighting police and the factory air defense system) also had to be subject to uniform conditions for their tactical cooperation. As an example, attention is drawn here to a decree issued by the Reich Minister for Aviation and Commander in Chief of the Air Force on 24 April 1943 concerning the employment of firefighting forces against large fires. The decree was issued under the title "Basic Rules to insure the Effectiveness and Development of Firefighting Forces for Action against Large Fires (Grundregeln fuer die Kampfkraft und die Entwicklung von Feuerloeschkraefte zur Grosstrandbekaempfung)⁴⁶⁴ The basic rules dealt with the tactics to be employed on the basis of graphically explained examples. They were applicable to the passive air defense troops, the firefighting forces of the various other passive air defense organizations and to the

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463. See Annex A.

464. IV, b, 1, above.

348 local and regional control authorities of passive air defense for the commitment of complete firefighting units.

That complications of the most varied type resulted with the various responsible authorities in the compilation of regulations of this nature is only natural and was due to the form of the existing organization.

The off-post employment of small and large passive air defense units in mobile operations gained steadily in importance. The important point now was to make the experience gained in frequently attacked areas, and the methods of passive air defense operations found to have been most effective in practice there, available in time to those responsible for the direction of passive air defense in areas which had not yet come under attack, in order to avoid the errors usually made when a place came under attack for the first time. This was done by means of war games and situation critiques, conducted primarily by the air district commands and on a lesser scale by the commanders of regular police.

Even prior to the war great importance had been attached to the realistic simulation of actual damage and of conditions as they would actually be in the case of air attacks.⁴⁶⁵ The majority of the staffs and smaller and larger units participating in or directing such exercises and-or maneuvers had

⁴⁶⁵. Karlsruhe Document Collection: "Die Schadendarstellung bei Luftschutzuebungen" 1. Fassung 1939. Air Field Manual L.Dv. 770, Teil 4.

347 no experience in this field. The Reich Minister for Aviation and Commander in Chief of the Air Force therefore published, through Air Inspectorate 13, a regulation entitled "The Direction of Maneuvers and the Umpire Services (Leitungs- und Schiedsrichterdienst)."⁴⁶⁶ Maneuvers were carried out for the first time in Eastern Prussia. Later, agreements with the Army and Navy enabled passive air defense forces and organizations to participate in numerous local and regional field exercises and maneuvers. A concurrent purpose in this arrangement was to give added status to passive air defense, a subject considered as of secondary importance within the armed forces. Lacking this status, the whole system would have been irresponsibly neglected in the matter of personnel, funds, and raw materials allocations. The central authority for training was the Reich Institute ^{of the Air Force} ⁴⁶⁷ for Passive Air Defense.

The training mission could be assigned only to an authority very closely integrated with the Reich Air Ministry. This insured that the regulations published by the Reich Minister for Aviation and Commander in Chief of the Air Force, as well as the principles established by that Office concerning the organization, training, command, and equipment of the civilian passive air defense system and the integration of

466. Karlsruhe Document Collection: Air Field Manual L. Dv. 770 Teil 2 "Leitungs- und Schiedsrichterdienst."
467. See III, g, above.

348 passive air defense with the command organization of the Air Force would speedily become generally known and accepted in all agencies involved.⁴⁶⁸

In order to insure proper coordination of all corporations, units, and organizations involved, it was also necessary to establish uniform definitions of concepts.⁴⁶⁹

349 The regulations and directives issued on the subject of training served their purpose well. However, this is due not to the regulations alone, but to the tireless efforts of all participants in the training program, who loyally performed their duties in spite of the steadily increasing severity of the conditions under which they had to operate.

b. The Individual Organizations of the passive air defense system all had their own educational and training establishments, all of which conducted their training programs in accordance with instructions and directives from the Reich Minister for Aviation and Commandx in Chief of the Air Force/Air Inspectorate 13, and in line with uniform principles established by the Reich Institute of the Air Force for Passive Air Defense.

Two training and replacement battalions existed to give training to officer personnel for the passive air defense⁴⁷⁰

468. Karlsruhe Document Collection: Vortragsdisposition: Wesen und Organisation des Zivilen Luftschutzes, Oktober 1936.

469. Appendix 12: "Bestimmungen im Luftschutz," Rd. Erl. R.d. L.u.Ob.d.L. (L.In.13) 31.5.1944.

349 troops:⁴⁷⁰

(1) For the Passive Air Defense Warning Service training took place in basic requirements at the Passive Air Defense Warning Service Replacement and Training Battalion.⁴⁷¹ A passive Air Defense Warning Service School for Female auxiliaries was available fo train women. Other training within the air district commands was given in continuous courses arranged by the passive air defense staff sections (Ia op 3) of the various air district commands.

(2) Of particular importance were the training establishments of the Passive Air Defense Police. The center at which higher echelon commanders received training was in the premises of the Passive Air Defense Academy in Berlin, and transferred after the destruction of these premises during an air attack to Oranienburg. This central school was controlled by the Chief of German Police. As a rule, the courses conducted at this school lasted two weeks.

The mission of the school at Berlin, and later at Oranienburg was to ~~train~~^{give} local passive air defense chiefs, officers of the regular police, the chiefs of technical services within the Passive Air Defense Police training which would qualify them for their command missions, and to familiarize them with the currently latest experience. If for no other reason the establishment of this school was necessary because the training battalion of the Reich Institute of the Air Force for Passive Air Defense was already overburdened with 470. See, V, above. 471. See IV, a, above.

359 the responsibilities of its other far more comprehensive missions. The Passive Air Defense School of the Reich Minister for the Interior (Chief of German Police) thus represented a valuable supplement in the field of training and performed its mission satisfactorily right up to the end. Its mission in no way overlapped those of the Reich Institute of the Air Force for Passive Air Defense, since the two organizations cooperated very closely and supplemented each other. Problems of who was the proper authority had no adverse influence on functional training activities.⁴⁷²

Within the military area commands passive air defense schools were maintained at the headquarters of the various commanders of regular police, at which the command and sub-command personnel of the ~~XXXXXX~~ passive air defense police received continuous training. Special courses were conducted here for those police officers who were to head the special operations staffs which became necessary in the last years of the war.⁴⁷³

Independent from the above arrangements, regular training was given to all organizations by the local passive air defense chiefs.

The Training Center of the Firefighting School at Ebers-

⁴⁷². See III, b, above.

⁴⁷³. See III, c, 3, above.

350 Eberswalde gave training to fire chiefs of the Firefighting Police, the Passive Air Defense Police, and the Passive Air Defense Guard Service (Luftschutzwacht),⁴⁷⁴ and a special training field was established for the purpose in the Tucheler Heide area. At the regional level numerous firefighting schools⁴⁷⁵ insured that all command and sub-command personnel in the firefighting services received thorough advanced training.

The Reich School of the Technical Emergency Service, already in existence in Belzig near Berlin was used to give advanced training to personnel of the repair and salvage branch.

(3) For the Factory Air Defense System the Reich Board of Industries, responsible in this field, had established a central school in Berlin to give advanced training. Command and sub-command personnel at the intermediate levels received advanced training in the subjects of factory air defense at the regional factory air defense schools. Local training was a responsibility of the local passive factory air defense agencies.

(4) The Reich Passive Air Defense Society, responsible for the organization and training of persons in the

⁴⁷⁴. In what were formerly designated Category II and III Passive Air Defense Localities. See III, c, 4, above.

⁴⁷⁵. Karlsruhe Document Collection: US Strategic--Continued

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351 individual or self-protection system, had developed a comprehensive school service. Control personnel in the self-protection system received advanced training at the Reich Passive Air Defense School, located initially at Berlin-Wannsee and later in Jena. This school had all modern equipment and visual aids and had a promoting influence on the lower echelon schools at the state group, regional group, and local group levels.

The Reich Passive Air Defense School in Berlin was under direct control by the Presiding Council of the Reich Passive Air Defense Society. Its primary mission was to train higher level officials of the Society and, through appropriate courses, to insure uniformity in all training measures. Each state group of the Society maintained a state group passive air defense school. Local chapters or groups of the Society had central passive air defense schools (Luftschutzhauptschulen), . These schools trained the various group officials, such as block wardens, subgroup chiefs, consultants on passive air defense building construction, and units which were responsible for the training of all participants in the self-protection system. The actual training of these personnel took place in the

352 passive air defense schools.

(5) As "special administrations" the three branches of the military establishment--the Army, the Navy, and the Air Force, educated and trained their own personnel independently in accordance with instructions received from the Reich Minister for Aviation and Commander in Chief of the Air Force, and with support from the Reich Institute of the Air Force for Passive Air Defense. For example, Chapter VII of the Guide for Instruction in Air Force Service Schools (Leitfaden fuer den Unterricht an den Luftkriegsschulen) contained a section entitled Civilian Air Defense,⁴⁷⁶ and all class members were furnished appropriate bulletins.⁴⁷⁷

The other "special administrations", such as the Railway and Postal Services, also trained their own command and auxiliary personnel under their own responsibility for their passive air defense missions, also with support from the Reich Institute of the Air Force for Passive Air Defense. As a rule these personnel participated in field exercises and maneuvers and other large-scale training events, and also participated in passive air defense activities within their respective localities.

The training system briefly outlined in the past few pages made it possible to give training to wide circles,

475.-Continued from p. 487: Bombing Survey, Civilian Defense Division Final Report, where details are given also on the whole field of training activities.

352 besides familiarizing the active forces with all newly ac-
 quired experience, and giving them practice in the applica-
 tion of such experience. It is due to this system that the
 353 German Passive Air Defense Services achieved their uniquely
 high standards of performance in spite of all the other dif-
 ficulties encountered.

VII. THE SUPPLY, RESUPPLY, and REPLACEMENT SYSTEM.⁴⁷⁹

In the matter of apparatus, motor vehicles, special type
 vehicles, and standard and special items of equipment needed
 for passive air defense purposes, it is necessary to differen-
 tiate between the initial issue and the wartime resupply
 services.

a. The subject of the initial issue of equipment, etc.,
 for the various passive air defense branches has been dealt
 with in the appropriate chapters of this study. The whole
 situation can be summarized briefly as follows:

(1) The Passive Air Defense Warning Service received
 its supplies through the Office of the Reich Minister for
 Aviation and Commander in Chief of the Air Force, with
 support from the Reich Post and Telegraph Service in mat-
 ters of signal communications. Special types of equip-

ment and vehicles were ordered directly by the Reich Mi-

476. Karlsruhe Document Collection: "Ziviler Luftschutz" ex-
 cerpt from Chapter VII.

477. Ibid : "Merkblatt ueber Flugmeldedienst, Luftschutzwarn-
 dienst, Ziviler Luftschutz."

478. See IV, f, and IV, f, 1, above.

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Minister for Aviation and Commander in Chief of the Air Force from the manufacturing firms, who delivered them directly to the various passive air defense localities.

The main items involved were stationary and motor vehicle sirens, and other items of equipment for the warning posts.

(2) For the Category I Safety and Auxiliary Services, local organizations and establishments already in existence were used. Supplementary equipment, and particularly supplementary motor vehicles were ordered in accordance with customary peacetime routine; after call up of the Passive Air Defense Services such items were requisitioned under the laws regulating the requisitioning of property and services for defense purposes. No issue of equipment and motor vehicles could be made to Category II and III localities. Owing to the small allocations received, these localities had to be neglected in favor of areas of main effort.

The following applied in the case of the individual sub-organizations of the Safety and Auxiliary Services:

The actually available fireengines in the firefighting services were increased to the authorized numbers by deliveries through the Reich Minister for Aviation and Commander in Chief of the Air Force/Air Inspectorate 13, of

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newly developed and tested types of vehicles with better performances. The same applied in the case of special types of vehicles and equipment.

For the Repair and Salvage Branch special types of vehicles were developed with support from the Technical Emergency Service and delivered after proper testing.

For the Decontamination Service the same applied, with the proviso that calls were made on the various road cleaning agencies, with their vehicle and equipment depots. The Decontamination Service was an entirely new establishment, for which the special items of equipment, vehicles, and protective clothing (against gas) had to be developed and delivered.

The Passive Air Defense Medical Branch and the Veterinary Branch had to be furnished supplementary instruments and other medical supplies.

Particularly large supplies became necessary to fit out the various stationary establishments of the above organizations, such as repair and maintenance depots, first aid stations, decontamination depots, commodity decontamination centers, auxiliary hospitals, examining stations of the most varied types, and medical and veterinary supply

479. Karlsruhe Document Collection: "Das Versorgungs- und Nachschubwesen des zivilen Luftschutzes," by Oberregierungsrat Hans Wickel, 1926.

for the repair and salvage through special types of
vehicles were developed with support from the technical
emergency service and delivered after proper testing.
for the reconstruction service the same applied,
with the proviso that units were made on the various
road clearing agencies with their vehicle and equipment
reports. The reconstruction of the was an entirely new
establishment, for which the special items of equipment,
vehicles, and protective clothing (flame gas) had to
be developed and delivered.
The Executive Air Police Federal Branch and the other
agency which had to be furnished supplementary instruction
and other material supplied.
Particularly large supplies became necessary for the
out the various emergency establishments of the above
organizations, such as repair and maintenance reports, the
all stations, reconstruction reports, emergency de-
struction centers, auxiliary hospitals, armory, etc.
of the most varied types, and medical and veterinary equip-
ment. Reconstruction Document Collection: "Das Versoren- und
Reparaturwesen des zivilen Luftwaffens." by Oberst-
Ing. Hans Wiesel, 1930.

depots.

(3) The supply of equipment for the Factory Air Defense System, and for the Self-Protection and Extended Self-Protection Systems was directed centrally from the Office of the Reich Minister for Aviation and Commander in Chief of the Air Force by Air Inspectorate 13. Factories had to pay for their own equipment, for which they received compensation in the form of tax reductions. The Self-Protection and Extended Self-Protection Systems paid for their own equipment.

(4) The "special administrations" procured their own passive air defense equipment, and maintained adequate stocks, in accordance with directives and instructions from the Reich Minister for Aviation and Commander in Chief of the Air Force.

b. Resupply for Civilian Air Defense. The above description applies to the situation existing when World War II broke out. However, difficulties had arisen already in 1938 in the matter of allocations of raw materials. Because of the accelerated pace of rearmament in all three branches of the military a situation necessarily developed in which the already small supplies of raw materials were no longer adequate for the rearmament of all military branches in addition to the requirements for consumer commodities. Consequently,

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355 the Supreme Military Command drew up a ten-point program establishing the allocations to be made in order to insure completion of all military programs simultaneously or in order of importance and basing its finding on the current appraisal of the importance of the armed forces as compared with the requirements of passive air defense. In spite of vigorous protests by the Inspector of Passive Air Defense, the service was awarded tenth priority in this program.

This very seriously complicated the build up of the passive air defense system, with the result that it was inadequately equipped at the outbreak of war. Furthermore, the low priority awarded had made it impossible to carry out the intention to stockpile reserve supplies in special depots.

It was completely obvious to Air Inspectorate 13 at the time that the current methods of centralized procurement and direct delivery of passive air defense vehicles and equipment from the manufacturers from current production would prove inoperable in the event of war.

356 The Chief of Air Force Supply and Administration at the time refused to accept the responsibility for supply and resupply functions for the "civilian" air defense service to be handled through the existing installations of the Air Force, although this arrangement was provided for in Special

356 Annex X to the Mobilization Plan (Air Force).⁴⁸⁰ The only remaining course was, therefore, to establish separate supply channels, in particular for the Safety and Auxiliary Services, with their planned authorized strength of 220 000. With approval from the Organizational Division of the Air Force General Staff, Air Force Inspectorate 13 thereupon established supply and resupply depots, which were designated

Passive Air Defense Equipment Depots.

By the end of 1939 these depots were operable in organizational, administrative, personnel, and materiel respects. At that time the depots were not an establishment for the troops, but were organic to the Safety and Auxiliary Services.

As the designation implies, the newly established supply system handled only equipment specifically for passive air defense purposes. Medical equipment was handled by the Air Force medical supply depots responsible in the various air district commands, and clothing supplies by the appropriate Air Force clothing offices (the latter for the Passive Air Defense Warning Service and for the Safety and Auxiliary Services).

It was now possible to direct vehicles and equipment supplies coming from current production to the appropriate Air District Commands in accordance with expected requirements. Unfortunately, however, deliveries fell far short of 480. See II, b, above.

356 actual requirements because of the low priority awarded to the service. Repeated efforts finally resulted in an increased industrial output of the items required, so that the requirements of the passive air defense equipment depots were met in about 1940.

An equipment depot was established for each air district command within the Zone of Interior, with the exception of Air District Command I, at Koenigsberg, Eastern Prussia. In addition, one depot was established in Austria, and one in the Protectorate of Bohemia and Moravia. The depots proved particularly important for the activation and commitment of new motorized units of the Safety and Auxiliary Services.

In 1942 the passive air defense equipment depots were integrated with the Air Force. This measure resulted from the incorporation of the Safety and Auxiliary Motorized Battalions into the Air Force and a considerable increase of the passive air defense troops. From this point on the depots were responsible for supplies not only to the motorized passive air defense battalions, but also to the smoke battalions, and to the Special purposes passive air defense battalions employed in the maintenance and operation of dummy installations. Concurrently, the depots handled supplies for the former Safety and Auxiliary Services, which had meanwhile been redesignated as the Passive Air Defense Police.

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With the increasing severity of the enemy air attacks the necessity arose to decentralize the passive air defense equipment depots. Two field depots were established for each existing depot and the available vehicles and equipment were so stored that even if a main depot or one of the field depots within a supply area were destroyed supply operations would not be disrupted. Experience showed that the selection of locations for the depots and also the layout of the various depots reflected a correct estimate of the air threat. Only one main and one field depot were struck by incendiary bombs, which were extinguished before any damage was done.

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Organizational changes made in the top command echelons of the passive air defense system in February 1945 influenced the service supply channels. ⁴⁸¹ The passive air defense equipment depot system was again taken out of the Air Force budget and transferred to that of the Passive Air Defense police. This resulted in the anomalous situation that depots, now under the Chief of German Police, remained responsible for supplies to the passive air defense troops (motorized passive air defense battalions, the special passive air defense battalions, and the smoke battalions), as well as to the passive Air Defense Warning Service, so far as items of special equipment were concerned, because no other operable arrangement could be made for the time being. In order to avoid

⁴⁸¹. See III, a, 3, above.

358 interruptions in the flow of supplies, the Air Force personnel who had hitherto handled supply matters for the service were detailed temporarily for duty with the Passive Air Defense Police. The raw materials allocations were to be transferred later to the Reich Minister for the Interior (Chief of German Police). A more unfavorable time for any measure of this type could not have been chosen.

Establishment of the passive air defense equipment depots proved a sound measure. In any future system it will be necessary, however, to establish clearly defined supply channels from the very outset, and not to put off the build up of supplies in the depots until the last moment.

VIII. THE TECHNICAL BRANCHES OF THE GERMAN PASSIVE AIR DEFENSE SERVICES

A. Building Construction for Passive Air Defense Purposes 482

In the incipient stages of German civilian air defense the Office of the Reich Minister for Aviation and Commander in Chief of the Air Force found itself confronted with particularly serious problems in the field of building construction. Very little experience was available on the subject, although certain trains of thought had been developed in foreign countries, and although the pertinent German societies had concerned themselves with the problems specific

482. Karlsruhe Document Collection: "Bautechnischer Luftschutz," in "Handbuch der neuzeitlichen Wehrwissenschaft," Bücher Band, 2. Teil, 1939, pp. 8-14.

359 to building construction to meet the demands of passive air defense. The important requirement now was to state the problem clearly, issue appropriate instructions and directives to the responsible agencies, procure the necessary funds, raw materials, and personnel, and expedite the initiation of all necessary measures.

The mission was to exercise an influence on all building activities in all German territories which would bring about a steady decrease in sensitivity to air attack. It was essential that the principles of air defense should determine all preparations, plans, and execution of new structures intended to serve the German Nation, its economy, and its defense in any way. It was also important to reduce the sensitivity of existing buildings to air attack as far as possible.

Requirements therefore had to be stated in the following fields:

- (1) Planning and lay out in all building programs within Germany;
- (2) Application of the proper principles in all large-scale settlement projects, such as township developments, reconstruction in cities, new settlements;
- (3) Measures to protect production and traffic;
- (4) Measures to insure adherence to the principles

359 in the details of every individual structure;

(5) Measures to protect the population (the construction of air raid shelters)⁴⁸³.

360 Once a clear concept of the mission had crystallized,⁴⁸³ the Reich Minister for Aviation and Commander in Chief of the Air Force lost no time in issuing, through Air Inspectorate 13, in cooperation with the appropriate central Government authorities, and with support from the Reich Institute of the Air Force for Passive Air Defense,⁴⁸⁴ the directives essential to insure proper application of all necessary measures. As experience became available, the directives thus issued were modified or supplemented.⁴⁸⁵

In a speech the Reich Minister for Aviation and Commander in Chief of the Air Force formulated his ideas on the subject of building construction for air defense purposes briefly as follows:

In the future it must be impossible for one stone to be placed upon another without thought of passive air defense.

1. The Passive Air Defense Mission in Area Planning and Township Developments.

It was necessary to differentiate between overall area planning and organization for the whole of Germany, a responsibility of the Reich Office for Regional Planning (Reichsstelle fuer Raumordnung) on the one hand, and what was called functional planning (for example in the case of township develop-

360 development), residential area, and settlement area planning, and traffic and communications layout), matters which were handled by the various appropriate professional departments but which had to be fitted into the overall program of regional planning.

In addition to preservation of the military potential, an important objective in passive air defense from the very start was to provide safe shelter for the civilian population. Although the existing complexes of mass settlements and centers of manufacturing and other production centers, and centers of supply and communications had to be considered as particularly sensitive to the hazards of air attack, Germany's situation in respect to the magnitude of the dangers made it imperative to also extend all passive air defense measures to all other residential and working areas.

For the above reasons the problem of safe shelter for the civilian population could only be solved on an areal basis and not by means of a program of consecutive progress, which would have been more natural, and personal desires had to be subjected to the overruling requirements of the whole Nation.

All construction projects submitted for approval, whether they concerned an individual house, or the plans of a small or large

483. "Der Luftschutz im Bauwesen," Ministerialrat Leefken, in Knipfer-Hampe, "Der Zivile Luftschutz," p. 307.

484. See III, g, above.

485. A compilation of all pre-1939 measures will be found in Karlsruhe Document Collection: "Bautechnischer Luftschutz, (vor 1939)", by Dt. Col. Greffrath, 1954.

36D group or community, were approved only if they fitted completely into the overall plan.

Those responsible for passive air defense had concerned themselves with this realization as early as in 1936. The logical starting point in their considerations was that the closely settled major cities, which at the same time were the main centers of industry and traffic and communications, represented the main points of danger. The matter of reorganizing the form and content of these cities was therefore not only a requirement of area planning, of city hygienics, but above all a problem of passive air defense. The target was to bring about better spacing, to simplify, and to bring creative planning into play. The paramount principles had to be: to prevent any massing of people and industries; to keep residential and factory areas separate; and in this way to reduce sensitivity to air attack. This applied not only in the case of newly planned projects, where the lay out was to be such that large-scale damage could not occur, and it was action in such large-scale damage areas that so much effort had to be expended during the war. Measures also had to be taken to remedy what had been neglected or wrongly planned in the past. Therefore the reorganization of old cities was an important requirement, also from the viewpoint of passive air defense.

Hamburg-Altona carried out a program of reorganization which was exemplary in this respect. Here the heavily overcrowded slum section of the old town disappeared with its narrow and crooked alleys, its dark and sunless back yards, and unsanitary rear buildings to make way for a widely spaced settlement with rows of houses, which met most requirements in the fields of town planning, hygienics, traffic and communications, and passive air defense. In carrying out the program it was found that it was not always possible to completely remove all traces of the old unsatisfactory structure and replace them by the new ideal. In such cases great improvements were made by removal of rear buildings and of houses which had been constructed leaning against the narrow end walls of blocks of buildings. This made it possible to create new open spaces.

The defined mission called for long-range creative planning to organize or reorganize all regions and towns in line with the final target. This meant that the individual problems of building construction for air defense purposes as they occurred in national and state planning in the development of townships, and in the layout of settlements, could not be solved individually, but only as part of a natural complex and with due regard to the technical, economic, and passive air defense requirements. The innumerable problems which were encountered here, the way in which many of them overlapped, and their complete novelty, categorically required a mutuality of effort

362 in all fields of passive air defense, including the Self-Protection, Extended Self-Protection, and Factory Air Defense Systems and all other participants in the passive air defense effort. Intricate interrelations were frequently hard to discern, and this made it necessary to establish a construction program for the structural measures intended for passive air defense purposes.

The passive air defense construction program for a city had to be well considered and compiled with a view to the future. National interests had to take precedence over personal desires, the requirements and existing danger zones had to be ascertained, and on the basis of such findings the type and size of the structures to be constructed, ^{and} the sequence and rate of construction had to be recommended or established by orders.

As a rule the procedure in working out a passive air defense construction plan for a city was as follows:

(a) The following information was entered on the appropriate sections of the town map:

(1) The number of persons living in the area and the population density per unit of space;

(2) The number of buildings per unit of space;

(3) Industrial and other works in the area together with the number of persons employed and classified as

363 military, armament, other vitally important, and other works.

(4) The locality of Government and administrative buildings, telephone exchanges, hospitals, etc., and all other particularly important establishments or installations.

(5) Culturally important buildings, with details on the works to be protected.

(6) Existing possibilities to afford protection for human beings, animals, and property.

(7) Traffic media, such as rail roads, Autobahn superhighways, main roads, bridges, other important engineering structures, together with details on traffic density.

(b) An analysis of the above information in combination with an appraisal of the geographical position and importance of the city concerned made it possible to draw informative conclusions on the sensitivity of the city to air attack and the degree to which it was endangered. On the basis of these findings it was determined what scope of passive air measures were needed, and it was possible to compute the funds and ways and means required to meet the established requirements in a proper sequence of importance.

The person responsible for the compilation of a "City Passive Air Defense Plan" was the Lord Mayor as the local passive air defense chief. In this work the Lord Mayor in the first place consulted the appropriate planning departments

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364 of the Reich Office for Regional Planning . In the detail problems involved he was supported by the appropriate Board of Works and by the construction specialists of the Civilian Air Defense System (in particular by the Passive Air Defense Building Construction Advisory Councils of the Reich Passive Air Defense Society).

As a rule, the largest part of the preliminary work involved for a "Passive Air Defense Building Construction Plan" was that of determining the density of population in houses and the existing possibilities available to the population for self-protection. Besides providing for protection of the human and animal population, measures had to be taken at the same time to protect and store food, collections, works of art, etc.

In the non-technical parts of the statistical analysis it was necessary not only to inquire into the number of homes and persons within an area, but in particular to establish the population density. In calculating the shelter requirements, the highest figure thus obtained was broken down to show the percentages of men subject to the draft, persons for the self-protection system, persons who would move to the country in the event of acute danger, etc.

The technical part of the analysis was concerned with ascertaining where and to what extent suitable shelter could

364 be provided at the least cost and with the least complications for the human population and objects of value. For this purpose it was necessary to conduct an inspection of each house, each cellar, and all natural or manmade structures, such as caves, rock tunnels, disused mine shafts, and underground parts of former fortification works already in existence which could serve as shelters.

In computing the maximum floor space available in cellars for the construction of shelters, it was necessary to subtract an appropriate percentage to allow for the space which would be needed in every cellar and even in the event of an acute threat for the storage of such items as food and coal.

The information gathered by the means described above also provided a valuable basis for the planning of large public air raid shelters. Other problems which could be taken ^{care} of at the same time were those of fire prevention, blackout facilities, etc.

Large numbers of qualified personnel were needed for the gathering of all this statistical data. The quickest and most practicable course was adopted in Saxony for the first time. The Reich Passive Air Defense Society assigned its officials and advisors on building construction to obtain the necessary information on subjects within its areas of responsibility.

I. IMPORTANT REQUIREMENTS IN THE EXPANSION OF CITIES!

- (1) Long-range planning.
- (2) Consideration must be given to higher echelon requirements of regional and state planning.
- (3) Residential and industrial areas should be kept apart.
- (4) The town area should be interspersed with green spaces, and as many large open spaces as possible should be provided.
- (5) Care should be taken to avoid the massing of population, industries, and traffic.
- (6) Military, armament, and other vitally important factories and other works should not be too densely concentrated.
- (7) The construction of buildings in the neighborhood of factories and other works and installations should be prohibited.
- (8) Care should be taken to provide wide traffic spaces, broad streets, and secure approaches to all buildings and other structures.
- (9) The most frequent direction of the wind should be taken into consideration in all building projects.
- (10) Rail depots should be in the outskirts of a town; installations of the health services should be outside of a town.

II. MEASURES TO IMPROVE CITY AREAS!

- (1) Decrease the size of the center of the city.
- (2) Decrease the population density.

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- (3) Establish maximum utilization standards.
- (4) Remove or thin out too densely crowded blocks of buildings.
- (5) Endeavor to secure widely spaced rows of houses.
- (6) Avoid the creation of closed dark, sunless, back yards more or less inaccessible to air.
- (7) Build broad strets.
- (8) Insure easy accessibility to all building plots.
- (9) Do not build houses to close gaps between existing houses if this is contrary to passive air defense interests. Instead rebuild if possible.
- (10) Prevent the creation of blind alleys caused by buildings constructed at the ends of streets.

III! SETTLEMENTS

a. Urban Settlements.

- (1) Establish purely residential settlements.
- (2) Prescribe minimum distance from important industrial installations.
- (3) Have all new structures properly spaced.
- (4) Place limit on population density and on use of ground for building.
- (5) Build broad streets in the main direction of the wind.
- (6) Insure that the whole settlement can be well aired.
- (7) Provide speedy transportation to insure exploitation of the cultural advantages of the city.

b. Rural Settlements.

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b. Rural Settlements.

- (1) Avoid creating villages of crowded houses.
- (2) Create a well spaced layout of farms around a village center point.
- (3) Insure that the houses blend naturally with the surrounding scenery.

The directives compiled in April 1935 by the Reich Committee of Works under instructions from the Reich Minister for Aviation and Commander in Chief of the Air Force defining the missions of national, state, and regional planning, local and industrial planning, city improvement, and the protection of buildings against the effects of air attacks required many years for execution and could only be realized in the future. Large funds and an army of workers would have been needed.

It is therefore only natural that only a very small part of the gigantic program was completed by the beginning of the war, since the time had been all too short. Very soon after the outbreak of war the highest authorities realized that an Emergency Program would have to be established for the planning and execution of passive air defense construction projects in place of the previously established measures, which had been projected for completion over a long period of peace.

In the case of communications and supply planning, the following principles still apply:

367 All traffic and all communications must be decentralized. Traffic concentrations must be avoided. Whenever possible traffic routes must be flanked on either side by open spaces. New installations must be constructed at a distance from traffic routes, and must have multi connections with the general routes.

368 The connecting routes must be spaced widely apart and the points at which they join the main route must be so wide apart that they will not all be endangered simultaneously in an attack. The routes must be blended with the surrounding terrain. Cuttings and embankments, and all other manmade structures must be avoided, since they can be recognized and hit by bombs. Supply installations and servicing installations must be so designed that they cannot be identified as such. Each should constitute a part of an integrated network, so that even if a number of them are rendered inoperable this will not disrupt supplies and servicing. For further details on this subject the reader is referred to the chapter in this study on the factory air defense system.⁴⁸⁶

The directives governing construction activities in the development of towns were issued by the Reich Minister of Labor, who on 28 March 1938 classified them as "For Official Use Only" at the request of the Reich Minister for Aviation. In order to make them really effective it became necessary to declassify them very soon.

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A general decree by the Reich Minister of Labor issued on 5 September 1942 recapitulated the former directives modified in the light of new experience.⁴⁸⁷

The requirements stated in the directives had an important impact on the planning and layout of towns and settlements. They required not only that inappropriate construction was to be prevented, but also that everything possible was to be done to remedy mistakes made in the past.

The general decree treated the following points:

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(1) The basic passive air defense requirements in the development of towns.

(2) The large area layout of towns and settlements.

(3) The requirement to keep heavily air-threatened works and other installations apart from residential buildings.

(4) The requirement for wide spacing in all building projects.

The principles dealt with here are still valid today.

The "Temporary Bulletin: Passive Air Defense Requirements in the Build Up of Towns (Verlaeffiges Merkblatt: Luftschutz im Staedtebau)" published by the present German Federal Ministry for the Construction of Homes in the final version of December 1952 is based on the above directives and is only modified to a certain extent in accordance with the effectiveness of modern

486. See IV, c, 2, above.

487. Karlsruhe Document Collection: Richtlinien fuer den bautechnischen Luftschutz im Staedtebau, RdErl. d. RAM, vom 5. 9. 1942.

369 weapons.

This Temporary Bulletin, which will not be treated in detail here, is organized in seven sections:

1. General Principles.
2. Organization of building areas.
3. Sites for air threatened installations.
4. Building types and methods.
5. Population density.
6. Traffic and communication facilities.
7. Supplies and utilities.
8. Passive air defense plans in township development.

The bulletin, also contains explanatory material, which is of importance because of the sources quoted.⁴⁸⁸

In any case it can be established here that in her passive air defense provisions for township developments Germany was headed in the right direction.

2. The Passive Air Defense Mission in the Selection of Industrial and other Sites. In selecting sites for new factories or other installations for industrial or communications purposes, or for new military establishments, very serious consideration had to be given to sensitivity of the individual installations to air attack and the degree in which they would be exposed to attack. Building sites in the vicinity of installations which were likely to come under attack could not be considered suitable for the establishment of new installations. Areas to be avoided for

488. Karlsruhe Document Collection:--Continued

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these reasons were those in which factories or other installations of the industry, the military, the traffic and communications systems, or other vitally important installations were located.

Salient terrain features, such as rivers, canals, railroad tracks, which were easily recognizable from great altitudes, would make it easier for enemy airmen to find any target in the locality. Therefore, the site for any new installation had to be distant from any terrain features which could serve as guides.

Here again, great importance had to be attached to the possibilities of natural camouflage. The new installations therefore had to be so arranged that they would not be too conspicuous in the surrounding terrain. They had to blend naturally with their surroundings. Advantage had to be taken of the existing natural possibilities to have shadows concealed by trees or other plants. For more information on the subject of artificial camouflage the reader is referred to the chapter on this subject.⁴⁸⁹

Because of the relatively narrow confines and the dense population of Germany, it was naturally impossible to meet

the above requirements on any large scale. The necessity to

488--Continued: "Luftschutz im Staedtebau," Dritte Auflage,
Bauverlag G.m.b.H., Wiesbaden and Berlin.
489. See VIII, d, below.

370 to link any new installation with main traffic routes and to provide quarters for the personnel it would employ, combined with the urgent need for speed, unfortunately made it necessary in many cases to adopt emergency solutions which later produced dire results.

This applies particularly to large area works, such as hydrogenation works and factories manufacturing Air Force equipment. The factory air defense system in existing factories was no longer able to accomplish its missions in the period of large-scale attacks, and it was impossible to maintain output at the necessary level. With the increase of enemy attack operations it therefore became necessary to move some of the more important factories, which naturally resulted in reduced production and delays in deliveries, a subject treated in more detail in the chapter on the transfer of factories.⁴⁹⁰

The following applied in the case of newly established factories and other installations:

The ~~smaller~~ a target is and the larger the open areas are by which it is surrounded, the smaller will be the percentage of bombs by which it is hit. Therefore, all new factories were ^{be kept to} to the smallest size shown by experience to be compatible with their economical and operational requirements, and the individual works making up a factory 496. See VIII, a, 3, below.

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had to be spaced as widely apart as possible.

One of the most important conditions in efforts to reduce the effects of air attack is met if the space required for living quarters, for working sites, for factory operations, and for storage is provided in a number of widely spaced small buildings instead of in a few large buildings. This is a categoric requirement to reduce sensitivity to air attack for the following reasons:

a. The Effects of Explosive Bombs. The danger of blast compression exists when buildings are too closely spaced and when they have completely or partly enclosed yards; when houses are build in closed blocks; or when the front or rear of a row of houses is interrupted by protruding parts of a building or by a building placed at right angles. Solutions must therefore be sought which will permit the free escape of a bomb's blast pressure.

b. Incendiary Bombs. Wide spacing will prevent the spread of fires from house to house. This is also the only way to enable firefighters to approach the fires.

Furthermore, wide spacing makes it possible to provide more effective protection for the employees and to accelerate the resumption of manufacturing operations.

In selecting a site for a factory or other installation it is important to insure that the features remain

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unchanged which make it suitable at the time of selection from the air defense point of view. Therefore, care must be taken to insure that no other building will be allowed nearby in the future.

The first edition of Passive Air Defense Building Construction Directives to be Observed in Planning (Richtlinien fuer den baulichen Luftschutz bei den Aufgaben der Planung) was issued by the Reich Minister for Aviation and Commander in Chief of the Air Force through Air Force Inspectorate 13 as a decree on 8 January 1938 . This decree established a "protective distance" of 550 yards (500 meters) to be left between highly endangered installations on the one hand, and residential, settlement, or business areas on the other. War-time experience in large-scale attacks showed that this distance had to be increased to 1 100 yards. The appropriate regulations were published in a decree issued on 28 August 1942⁴⁹¹, which also enumerated the types of factories, installations, etc., to be considered highly endangered.

It was to be assumed that any enemy would take primary action against that weapon which constituted a threat to its own factories and other targets which were of decisive military importance. In building up and expanding the industries

491. Karlsruhe Document Collection: "Luftkriegserfahrungen auf dem Gebiet der Planung, R.d.L.u.O.b.d.L., Nr. 23112-42 (L.In.13/3 II Aa) vom 28. 8. 1942."

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supporting the German Air Force it was therefore essential to proceed primarily in accordance with air defense principles. In line with the general principles and requirements stated by the Reich Minister for Aviation and Commander in Chief of the Air Force through Air Force Inspectorate 13, and in cooperation with the Reich Office for Regional Planning (Reichsstelle fuer Raumerdnung) and the Reich Economics Ministry (Reichswirtschaftsministerium) and the other agencies involved, steps were therefore taken to formulate the principles to be observed in planning and construction, and to initiate immediate measures for their execution. The principles thus established applied to all planning and designing, to the size and construction type of halls and sheds, of air raid shelters, of blackout facilities, to protection against fire and explosions, and to protection of electric power stations, worker settlements, etc, and to the commitment of forces during and after air attacks.⁴⁹²

To serve as a model, the aircraft engine factory of the firm of Daimler-Benz Motoren GmbH., was constructed at Genzhagen, Berlin, the first construction phase of which was completed in 1936-37.

492. Karlsruhe Document Collection: "Richtlinien des Luftschutzes fuer den Aufbau und Ausbau der Luftwaffenruestungsindustrie, von Oberst Ing. z. Wv., Haase-Berton, vom 26. 5. 1935."

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In this case the whole factory complex was built in line with all experience available in the field of air defense and without any regard for profitability. It was due to the wise selection of the locality, the dispersed outlay with natural and artificial camouflage, and the well-considered construction and operation of appropriate dummy installations, ^{and} use of smoke screening, that this factory complex did not come under serious attack before 8 August 1944. In all previous attacks, the bombs had been delivered on dummy installations. Later, however, it became necessary to transfer the factory installations to limestone caves in the Mosbach-Neckarelz region. ⁴⁹³

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With the abovementioned decree of 28 August 1942, the Reich Minister for Aviation and Commander in Chief of the Air Force, through Inspectorate 13, furnished information on the conclusions drawn from experience in actual air warfare applicable to the selection of sites for installations which were likely to come under air attack. From then on such installations were to be established as far as possible from residential areas. According to local conditions the distance was to be at least 1 100 yards, in the case of installations where the danger of air attack was particularly acute, such as large hydrogenation plants, shipbuilding yards, aircraft factories, the distance was to be several miles.

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New armament factories were established in the central, eastern, and southeastern areas of Germany at the beginning of the war. Lack of time and shortages in labor and materials necessitated the construction of temporary type buildings as billets for the employees. Cantonment camps, some large, some small, were established for these purposes. A decree by the Reich Minister for Aviation and Commander in Chief of the Air Force on 4 January 1941 established that cantonment buildings were to be at least 11 yards apart, and that firewalls were to be separated by a distance of at least 44 yards. Other requirements were that the attics were to be accessible from the various fire prevention sections, that the material used in construction was to be fire-proofed, and that shelter trenches and water supplies for firefighting were to be available. On the basis of the first wartime experience the Reich Minister for Aviation and Commander in Chief of the Air Force decreed on 15 July 1941 that cantonment camps were only to be established outside of cities or at least outside of city areas particularly exposed to or sensitive to air attack.

At the instance of the Reich Minister for Aviation and Commander in Chief of the Air Force, the Reich Labor Minister on 30 October 1941 issued directives concerning fire 493. See IX, c, below.

374 prevention and passive air defense measures required in building construction. From then on cantonment type buildings were to be spaced at least eleven yards apart at the ends, and twentytwo yards apart along the sides.

Also at the instance of the Reich Minister for Aviation and Commander in Chief of the Air Force, the Reich Minister for Armament and Ammunition ordered that cantonment camps were to be erected at sites where they would blend with their surroundings and at a safe distance from residential or industrial areas. The distance prescribed for small camps holding up to 1 000 persons was 220 yards or more, for large camps holding more than 1000 persons 550-1 100 yards or more. The decree also established specific requirements for the grouping of the buildings, the provision of fire lanes, of camouflage, of water ponds for firefighting, and of shelter trenches.

At the request of the Reich Minister for Aviation and Commander in Chief of the Air Force, the Plenipotentiary General for Building Construction on 22 April 1943 decreed certain conditions governing the reconstruction of cantonment type buildings in areas exposed to the air threat. The decree stated that wartime experience had revealed the necessity

375 for even more stringent passive air defense measures. Cantonment type buildings in the future were to be twice as far apart as in the past (now 22 yards at the ends, and 44 yards at the sides), and that they were to have stone or cement floors. Reestablished cantonment camps were to have no timber structures; instead they were to have temporary type masonry houses.

To preserve cantonment camps constructed under former directives and still in existence in air threatened areas, the Plenipotentiary for Building Construction, again at the request of the Reich Minister for Aviation and Commander in Chief of the Air Force, on 11 June 1943 issued a decree requiring the following immediate measures:

Localities were to be changed by moving the camps in part or in their entirety, even if this meant that the employees would have a longer distance to cover on their way to and from work. If necessary some buildings were to be demolished to secure better spacing. Camouflage effects were to be achieved by fitting the camps into their surroundings.

As the war entered its final phases it became increasingly obvious that the only real protection was that afforded by regular bunker type shelters, tunnels--if a thick enough

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roof of solid rock was available, and in some circumstances deep shelter trenches. These latter, however, could serve only for a short while, particularly during rain or cold weather.

On the whole, industrial installations established in caves, mine shafts, forests, and deep and narrow valleys escaped destruction. In other cases wide dispersion in most cases averted total destruction.

3. The Relocation of Industrial Works. When the Allies commenced their war of strategic bombing, the area available to Germany had already been narrowed down considerably, and the German air defense system was no longer in any position to repel the attacks. The bombloads carried by the attacking planes grew bigger, and systematic operations commenced to neutralize and destroy German factories. At the same time traffic was seriously disrupted. Operations against German bottleneck industries were directed against fighter aircraft production, hydrogenation works, tank factories, and traffic and communications facilities and media.

The measures of passive air defense adopted were no longer adequate to insure uninterrupted manufacturing operations, and the vitally important requirement now was to radically decentralize factories and subsidiary installations manufacturing equipment, as well as all other installations produc-

376 producing commodities of vital importance for the war effort.

The initial step taken for this purpose was to shut down whole branches of those industries which were not of direct military importance, such as the textile works in Saxony, and move factories producing armaments into their premises. How-
377 the possibilities in this direction were soon exhausted.

Finally, the only possible course left open was to move essential factories underground, under mountains, into tunnels, and into mine shafts. However, this process of relocation started too late to produce decisive results so far as the maintenance of industrial output was concerned.

The relocation of industries currently in operation is always accompanied by disadvantages. The personnel available are no longer adequate; experience showed, in fact, that personnel requirements were doubled during the first few months. An added complication in Germany was the necessity for close supervision, since of the personnel employed in the armament industries 80 percent were foreigners from 22 different nations. All other difficulties and disadvantages were aggravated by the increasingly long distances between the various mutually supporting industries, a factor which further delayed manufacturing processes.

Movement to Above-Surface Locations.⁴⁹⁴

Here the German system differentiated between alternate

377 or precautionary plans and immediate plans. In the first case all preparations were to be made by a factory so that, if it were destroyed, operations could continue smoothly in alternate installations prepared beforehand for the purpose. This system of planning extended initially to 280 factories engaged exclusively in the manufacture of items for the Air Force.

The immediate plan system applied to a number of key installations,⁴⁹⁵ intended for immediate relocation.

In the first years of the war important industries were relocated in the eastern and southern areas of Germany. Later, some of them had to be moved back again speedily, a process which necessarily resulted in reduced output. Initially such factories were moved to areas of Germany still beyond the range of bombers in 1942. For this reason it became necessary to move them again later on. In some cases the firms opposed the orders to move to new localities, desiring to preserve their factories for post-war purposes. In such cases drastic steps had to be taken.

Just as important as it was to find contiguous areas for manufacturing works was the problem of housing for the employees. Cantonment type buildings were no longer adequate for this purpose, and buildings such as schools, inns, ⁴⁹⁵Karlsruhe Document Collection: "Verlagerung der Luftwaffenindustrie" (aus Amtschefbesprechungen am 5.2.1943).

377 and castles, which might otherwise have been used, were in increasing demand to house persons who had been bombed out of their homes.

The object in moving factories to new surface locations was to reduce the size of individual targets by means of a systematic dispersion, thereby to increase their number, and thus cause a dispersal of the attacking forces.

For Germany's air armaments it was a race for time and space, with Germany's chances of success receding, however, from month to month.

One might say that the attacks were following up the German relocation movements and striking the newly established manufacturing sites systematically and with precision.

The result of these attacks was that Germany's aircraft industry was in a perpetual state of transition.

It is only natural that this constant movement had⁴⁹⁶ an exceptionally serious impact on manufacturing operations.

Movement to Underground Sites.⁴⁹⁷

Really serious attempts to move aircraft industries under ground only commenced after all possibilities for their relocation above ground had been exhausted. The start was made, unfortunately only as late as in the autumn of 1943, under direct instructions from Reich Marshal Hermann Goering. In the past the only measures taken had been of a makeshift nature by movement into new surface premises designed to maintain output and to avert further

494. For details see Karlsruhe Document Collection: "Luftschutz und Luftwaffenrüstung I und II (Die oberirdische und die unterirdische Verlagerung)", Oberstlt. a.D. Greffrath, 1954.

496. See source quoted in Footnote 494, Teil I, last page.

378 losses in manufacturing capabilities.

From the start labor shortages and inadequate transportation facilities necessitated a very careful selection of the branches of the industry which were to ^{be}relocated underground. The movement to already existing underground locations, such as mine shafts, tunnels, and the subterranean passages of old fortifications required less time than the creation of such shelters would have, and in fact even less than movement to sites where concrete protection above ground would have been necessary.

It was difficult to find a solution for the problem of camouflage during reconstruction work. The speed with which the work had to be carried out further complicated matters and in some cases resulted in more buildings being taken under attack than the available labor forces could manage to evacuate in time.

Fighter manufacturing installations were moved underground first.⁴⁹⁸

The importance attached to underground manufacturing sites is clearly revealed in passages of Global Mission, by Air Marshal H. H. Arnold, USA.⁴⁹⁹

497. For details see source quoted in Footnote 494, Teil -II-

498. See Appendix 30 for example: Jet Aircraft Factory Kahla.

499. Karlsruhe Document Collection: "Unterirdische Verlagerung der deutschen Flugzeugindustrie," excerpts translated from Global Mission.

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A particularly impressive example of underground re-
location is that of the Desdemona Factory (Werk Desdemona)
of the firm of Glaukonit A. G., in Hohenems, which was moved
to underground premises in three galleries, one below the
other.

500. Karlsruhe Document Collection: Photstat Copy No. 4374-
859 (164: Werk Desdemona--Underground Shelter.

4. Passive Air Defense Requirements in the Field of Above-Ground Building Construction.

a. With a View to the Effects of Explosive Bombs. The sensitivity of a structure to air attack is reduced if the structure is so built that bombs striking near by or at a distance will not cause its collapse, but will cause only minor damage which can speedily be repaired. For this reason all buildings--and the stringency with which this rule was enforced depended on the importance of the building concerned--was to be so anchored in the ground that they were to a great extent proof against the effects of shifts in the ground, such as jolts, buckling, uneven settling, or sideslipping. They were to be so constructed that the supporting skeleton of upright supports roofs could not be caused to lose cohesion or weakened dangerously by pressure from any side.or direction.

The above specifications were best met in buildings constructed on a skeleton system. In this category preference should be given to the trelliswork systems in which the individual sections in themselves were highly resistant to bending even under horizontal pressures, or in which skeleton ~~XXXXXXXXXX~~ supporting frameworks or of adequate mass and bulk were so joined that the force of any horizontal pressure would be conducted from the support frame to

381 the ground

Where there was no possibility to use the framework or trelliswork support system of construction, many possibilities existed to improve other types of structures, methods which were dealt with in the appropriate literature.

b. With a View to the Effects of Incendiary Bombs.

All structures had to be designed to prevent a quick and destructive spread of development of fires. For this purpose, every building had to have an attic above the top floor. Attics were to be easily accessible, open to vision in all parts, were to have no hidden corners, and if possible no partitions.⁵⁰¹ The development of heat pockets is best prevented by a tile roof. Specifications were also established for the degree of penetration resistance and fire resistance of roofs.

To reduce fire hazards decrees were issued containing regulations governing the construction of hard surface ceilings, the use of side rafters (Randbalken), stone stairs, stairwells, fire and other separating walls, the partitioning of attics, and the provision of water faucets.⁵⁰²

Wherever these instructions were carried out they proved sound, but in view of the large-scale attacks which took place there was no chance for them to produce any

382 real success in closely built up town areas.

The requirements briefly sketched in the foregoing passages as applicable in the field of above-ground structures still remain valid. All that is necessary is to adapt them to meet the requirements resulting from the increased effectiveness of future weapons.

Oberregierungsrat⁺ Leutz of the present German Federal Ministry for Housing has formulated the requirements stated under (a) and (b), above, briefly as follows:

What we are striving to attain is on the one hand a fireproof house, on the other hand types of buildings as proof as possible against the forces of pressure and suction. The steel-skeleton-supported concrete system of construction, for example, is very suitable for this purpose.

5. Air Raid Shelter Construction. Protection of the civilian population against the effects of air attacks was and still is the cardinal requirement for preservation of any country's military potential. Production of any kind hinges upon the capabilities of the working population.

In total warfare practically every man ^{every man} has to participate in one way or another in the manufacturing and other producing

501. "Verordnung zur Übung der baulichen Feuersicherheit" vom 20 August 1943 (RG Bl. I, p. 497).

502. See VIII, b, below.

503. "Baulicher Luftschutz," in Volume 1, Schriftenreihe ueber zivilen Luftschutz, Verlag Gasschutz und Luftschutz, Koblenz, 1953, p. 98.

+ Oberregierungsrat=High level Government counsellor in the second ministerial grade.

383 processes. The first responsibility was to preserve that working capacity and to to give every man the confident feeling that he and his family were being protected. This opened up a wide field of diversified activities. It was necessary to create protective facilities

- (1) within the individual houses;
- (2) for persons caught unawares by an air alert while away from home;
- (3) within factories, installations, offices, and other working places.

The shelter, later officially called air raid shelter, had to afford protection against fragmentation, against the blast effect of high explosive bombs, and against gases.⁵⁰⁴

From the technical point of view, it was even possible to provide protection against all contingencies, including the effects of direct hits. However, the expenditure in funds, materials, and labor were so great that such structures could only be provided on a limited scale in bunker type shelters.⁵⁰⁵

384 Numerous regulations were issued dealing with the various technical and organizational problems involved in

504. "Schutzraumbau," by Regierungsbaurat Dr. Ingenieur Fremmheld, in Sammelwerk Krieger-Hampe: "Der Zivile Luftschutz", p. 318.

505. See VIII, a, cc, below.

384 the construction of air raid shelters.⁵⁰⁶

The Second Decree in Implementation of the Passive Air Defense Act of 4 May 1937⁺ applied to the construction of shelters in new, reconstructed, or enlarged buildings.⁵⁰⁷ The basic requirements were stated in the First Regulations Effectuating Paragraph 1 of the above Second Decree.⁵⁰⁸ Supplementary to the above, the Reich Minister of Labor in turn issued explanatory and effectuating regulations within his sphere of authority.⁵⁰⁹

From the start it was necessary in the field of air raid shelter construction to take into account the existing shortages in certain construction materials, particularly steel. The Reich Minister for Aviation and Commander in Chief of the Air Force issued instructions on this subject in his decrees of 1 June 1937,⁵¹⁰ 30 November 1937,⁵¹¹ and 22 July 1938.⁵¹²

The increasing severity of the air situation and the dense massing of populations in particularly endangered areas because of the establishment of new and the relocation of existing factories in combination created practically insoluble problems in the field of air raid shelter

506. Karlsruhe Document Collection: "Beuweit--Wertleutungen."

507⁺ "Zweite Durchfuehrungsverordnung zum Luftschutzgesetz vom 4. Mai 1937"; See Footnote 506, above, and II, d, above. Text as promulgated on 31 August 1938 RGBl. I, p. 568.

508. Footnote 506, above, for source, p.27 (RGBl. I, p. 568).

509 Ibid, p. 39 of 13 May 1937.

384 construction. Conferences between all of the highest authorities concerned on measures which could be taken to speed up and increase the scope in the construction of shelters by means of a concentration of efforts resulted in the issue of what was called the Fuehrer Construction Program (Fuehrerbauprogramm) on 10 October 1940 in the form of a direct order from Hitler.

Among others, this order contained the following instructions:

(1) Basic directives concerning passive air defense building construction activities for protection of the civilian population. The definition of passive air defense localities in which an immediate program was to be initiated involving the following construction measures:

- (a) bomb proof air raid shelters
- (b) immediate emergency measures
- (c) openings to be made through fire walls
- (d) improvement of existing air raid shelters of all types
- (e) the use of cellars in national and state owned, other public, and privately owned buildings
- (f) air raid shelters for the Extended Self-Protection System; and the Factory Air Defense System at the expense of the Nation; execution of passive air defense building construction measures by the Plenipotentiary for Building Activities; the establishment of priority sequences by air district commands in agreement with the regional representatives of the Plenipotentiary for Building Activities.

(2) Directives to improve existing air raid shelters

- 510. Ibid, p. 72 ZL 5 c 9268/37
- 511. Ibid p. 85 ZL 5 a 11453/37
- 512. Ibid p. 86 ZL 5 c 13039/38.

385 with support and advice from passive air defense construction experts and officials of the Reich Passive Air Defense Society.

(3) The role of the air district commands in directing the execution of the passive air defense construction measures ordered within the scope made possible by available labor and materials and in the proper sequence of importance.

(4) Authorization of the air district commands to take action under the Fuehrer Construction Program to improve the effectiveness of public air raid shelters in particularly endangered localities by means of dummy installations. Appeals to the public to improve existing improved shelters independently of any other action taken.

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(5) Instructions to the various local chapters of the Regional Factory the ~~FACTORY~~/Air Defense System to compile lists showing recommended sequence of priority for air raid shelter construction under the Factory Air Defense System. Final decisions to be made by the appropriate air district commands.

The plans for each individual factory or other installation were to be subject to examination by regional representatives of the Plenipotentiary for Building Activities in the matter of economy and technical standards. Construction plans and cost estimates were to be submitted by the management concerned. Construction to be carried out by

386 the factory or other installation concerned.

(6) Regulations establishing the allocation of building materials for air raid shelters under the Factory Air Defense System.

(7) Directives governing the turnover of air raid shelters and other passive air defense structures by the directors of construction to the appropriate regional representatives of the Plenipotentiary for Building Activities within the scope of the Fuehrer Construction Program, to take place in two stages

- (a) Preliminary acceptance
- (b) Final acceptance.

(8) Instructions that crew members of ships using national waterways were also authorized to seek protection in all air raid shelters.

(9) Measures to complete air raid bunker type shelter currently under construction under authority of the "Directive for the Construction of Bomb-Proof Air Raid Shelters (Anweisung fuer den Bau bombensicherer IS-Raume). Adaptation for the construction of air raid shelters of plans already prepared or to be prepared/to meet the requirements of the Regulations for the Construction of Air Raid Shelters (Bestimmungen fuer den Bau von IS-Bunkern) as revised in July 1941.⁵¹³

⁵¹³. See VIII, a, 5, cc, (2), below.

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Establishment of responsibilities: the air district command involved was to be fully responsible for direction of all activities, and was to establish the priority sequences, for all passive air defense measures to be executed, in agreement with the appropriate regional representative of the Plenipotentiary for Building Activities, particularly in respect to what was to be constructed, and when and where it was to be constructed. Responsible for execution of the Fuehrer Construction Program was the Plenipotentiary for Building Activities, in Berlin this responsibility was vested in the Inspector General of Works.

In a decree dated 31 July 1941 the Reich Minister for Aviation and Commander in Chief of the Air Force ordered that emphasis was to be shifted to execution of the Fuehrer Construction Program. A second series of structures was to be undertaken in a number of particularly endangered localities at the expense of delaying passive air defense building measures in other localities^{which}/were were not so seriously threatened.

The increasing gravity of the air threat necessitated increased passive air defense measures, also in localities

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387 hitherto not covered by the Fuehrer Construction Program.

The Reich Minister for Aviation and Commander in Chief of the Air Force therefore ordered by secret decree (Erlaß Nr. 41 I 4239 Nr. 4718/43. geheim) dated 24 March 1943

that in addition to the Fuehrer Construction Program currently being implemented, the program was to be extended in the following points:

(a) Development and improvement of air ~~RAIDERS~~ raid shelters for the civilian population in particularly endangered areas hitherto not included in the program;

(b) Development and improvement of passive air defense installations of the various services, such as the air warning detachments, public air raid shelters, passive air defense command posts, etc.

(c) Development of the air raid shelters for civilian hospitals.

Responsibility for the direction of these measures was assigned to the various air district commands, which were to act in agreement with regional National Socialist Party Leaders (Gauleiter) and the regional representatives of the Plenipotentiary for Building Activities. Execution of the measures was carried out by the latter at the expense of the National Government.

Also supplementary to the expanded Fuehrer Construction

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387 Program, orders were issued on 18 May 1943 that all military personnel of the Army, the Navy, and the Air Force present in the Zone of Interior were to be employed in the construction of air raid shelter trenches.

The same order was issued on 30 June 1943 for all personnel of the Reich Labor Service. Here again priorities for the various passive air defense localities and for the measures to be taken was established by the appropriate air district commands in agreement with the Gauleiter and regional representative of the Plenipotentiary for Building Activities.

The provisions of the original Fuehrer Construction Program applied to a total of 61 passive air defense localities. As early as in July 1941, however, developments in the air situation made it necessary to continue the measures involved and extend the provisions of the program to a second series of measures comprising an additional 56 localities in the western and central areas of Germany. Another complication was the fact that the construction of bomb-proof shelters had to be seriously curtailed because of inadequate supplies of building materials, and shortages of labor, transportation, and fuel. Further deterioration of the air situation made it necessary to concentrate first of all on the measures to be taken in the areas of Air Dis

388 District Commands VI and XI.

On the basis of the current status in the execution of passive air defense projects, the Chief of the Passive Air Defense Operations Staff on 18 May 1943 compiled a list establishing priorities for the various passive air defense localities (Dringlichkeitsliste der Luftschutzorte).⁵¹⁴ In the accompanying report he stated that neither the building materials nor the fuel supplies available were adequate for completion of the program. It also contained a recommendation that a comprehensive all-out effort should be launched, similar to that for construction of the Atlantic Wall, to complete the program for the construction of air raid shelters. Unfortunately, this recommendation was not approved.

On 19 July 1943 Under Secretary of State for Aviation and Inspector General of the Air Force made another attempt to obtain approval for increased construction. The number of persons for whom shelter was provided at the time was estimated at 20 400 000. Of these only 840 000 had bomb-proof protection, while 19 540 000 had to rely on makeshift cellar structures. Experience having shown that makeshift shelters were of questionable value anyhow, the requirement was stated to speed up the construction of bunker type shelters and above all of fragmentation proof trenches.⁵¹⁵
514. Appendix 31.

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Difficulties were encountered throughout in all efforts to secure adequate labor forces for the construction of air raid shelters. These difficulties existed in all fields of the war endeavor, a fact clearly brought out in the documents of the Nuremburg trials.⁵¹⁶

Delays occurred in all construction projects, due both to labor and raw material shortages. Non-participants in the program also caused complications by submitting unqualified recommendations to the highest authorities, which resulted in the issue of directives by Hitler concerning technical problems already solved or on the best way to solution in the appropriate research and testing stations.⁵¹⁷

Records of the Central Planning Office reveal that the raw supplies and labor available in 1944 were far from adequate to meet the highly diversified requirements, and that there was no possibility to allocate sufficient to meet the needs of passive air defense.⁵¹⁸

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The experience gained in the construction of air raid shelters found expression in a compilation of directives issued in July 1955 by the present German Federal Minister for the Building of Homes (Bundesminister für Wohnungs-
Bau). The compilation is entitled Richtlinien für Schutz-

raumbau (Directions for the Construction of Air Raid

515. Karlsruhe Document Collection & "Luftschutz der Bevölkerung, text of a report to Reich Marshal on 19 June 1943.

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516. Ibid : "Deckung des Bedarfs an Arbeitskräften,"
from a report by Chief of Reich Chancellery Lammers
on a conference with Hitler, Appendix 38.
517. Ibid: "Luftschutzbau 1941," Report to the Reich
Marshal on 9 May 1941.
518. Ibid: "Luftschutzbauten 1944;" from records of the
Central planning Office, 5 April 1944.

390 Shelters and was prepared in agreement with the Reich Minister for the Interior. It is organized under the following headings:

Directives for Air Raid Shelter Construction
 Directives for Bunker Type Air Raid Shelter Construction
 Directives for Shelter Tunnel Construction
 Directives for Air Raid Shelter Ventillation
 Directives for Sealing of Air Raid Shelter Apertures.

The directives include a profusion of sketches, diagrams and technical data and allow for the widely diversified circumstances. It is therefore unnecessary to enter into details here on the experience gained in this field.

A compilation on the funds, material, and labor expended on the various types of air raid shelters in the last phases of the war is attached to this study⁵²⁰ (sic)

aa. Shelters Constructed within Houses. Preparations for protection of the civilian population initially had to be confined to a makeshift improvement of existing suitable space. The concentration of large bodies of people results in heavier losses during air attack. For this reason preference had to be given to the preparation of numerous small shelters rather than a few large ones. Steps had to be taken, however, that they would not be rendered

519. "Richtlinien fuer Schutzraumbauten," in a special volume of "Baustaublatt 1955", Bauverlag GmbH, Wiesbaden. No. 297:

520. Karlsruhe Document Collection: "Übersicht des Bauaufwandes fuer IS-Bauten verschiedener Konstruktion."

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390 unsafe by any possible overburden of debris or by house collapsing alongside of them.

The Temporary Local Instructions for Passive Air Defense of the Civilian Population (Vorläufige Ortsanweisungen fuer den Luftschutz der Bevölkerung) in Section IV contained the first regulations on this subject.

The instructions contained first directives on the selection and layout of shelters. Basically, the shelter was to consist of a number of rooms or compartments, the minimum being three, namely, the gas trap, the actual shelter, and the toilet compartment. Shelters were to be easy to find and easily accessible. If possible they were to be underground and were to have no pipelines. A brief compilation of technical specifications was published.⁵²²

The Ninth Decree in Implementation of the Civil Air Defense Act: Makeshift Passive Air Defense Measures in Existing Buildings (Behelfsmaessige Luftschutzmassnahmen in bestehenden Gebauden) provided a legal basis for action in the case of existing structures.⁵²³

Further directions were contained in the First Effectuating Regulations to Paragraph 1 of the Ninth Decree in Implementation of the Civil Air Defense Act (Erste Ausfuhrungsbestimmungen zum.....) and in the Second Effectuating Regulations: Regulations on Creating Openings through Walls

391 of Existing immediately Adjacent Buildings (Bestimmungen
ueber Mauerdurchbrueche in bestehenden, unmittelbar benach-
barten Gebaeuden)⁵²⁵ These openings proved a sound measure
and in many cases made it possible to rescue the inmates
trapped in a shelter.

392 Finally, the Reich Minister for Aviation and Commander
in Chief of the Air Force on 6 February 1944 issued a decree
under the title: Directives Governing the Nature and Scope
of Support to be Given in the Preparation of Makeshift
Air Raid Shelters and the Creation of Openings in Fire
Walls (Richtlinien und Umfang des Beitragens bei der Aus-
fuehrung von behelfemaessigen Luftschutzraeumen und von
Brandmauerdurchbruechen),⁵²⁶ which was supplemented by Second
Directives (Zweite Richtlinien)⁵²⁷ on 26 July 1941, and a
Supplementary Decree (Ergaenzungserlass) on 2 April 1942.⁵²⁷

521. See II, c, above.

522. Footnote 485, above, and Karlsruhe Document Collection:
"Bautechnischer Luftschutz (vor 1939)" by Greffrath,
1954.

523. For 31 August 1943 text see Karlsruhe Document Collec-
tion: RGBL. I. S. 522.

524. Ibid for 17 August 1939 text: RGBL. I. S. 1393.

525. Ibid for 12 March 1940 text: RGBL. I. S. 486.

527. Ibid for RGBL.Sp. 46, MBlIV S. 347.

528. Ibid: for RGBL. S. 103.

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From the start the free initiative of the civilian population was exploited in the approach to the problem of air raid shelters.

The officials of the Reich Passive Air Defense Society and the personnel of the self-protection system combined in contributing, outside of their other Passive Air Defense Society and professional duties, voluntarily towards bringing the problem of construction for air raid defense closer to a solution in at least their small field. For example, the Society organized construction teams, each consisting of appropriately trained Society officials serving as a cadre of technical personnel for above and below ground construction, surveying, skilled and unskilled labor, etc., plus volunteers from the self protection system.

The duties assumed voluntarily and on an honorary basis by these teams included:

(1) The training of personnel of the Self-Protection System in the subjects of building construction, passive air defense and engineering techniques. The object was to enable the trainees to carry out certain construction projects, in particular the construction of makeshift shelters, in a manner which met technical specifications.

(2) Efforts by word and deed to enlighten the public and secure their cooperation in shelter construction.

(3) The construction and maintenance of air raid shelter and other models.

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These voluntary construction teams gave frequent proof of their ability to exist and of their capabilities, and up to early 1937 remained a reliable and effective instrument of the civil air defense effort. The First Effectuating Regulations to Paragraph 1 of the Second Decree in Implementation of the Civil Air Defense Act: Air Raid Shelters Regulations (Schutzraumbestimmungen), issued on 4 May 1937, ended voluntary participation in the construction of air raid shelters and made such activities compulsory.

In exceptional cases, for example where inadequate or no cellar space was available or could only be developed at disproportionately high cost or had to be newly constructed, it was permissible under certain conditions to provide shelters in the ground floor, the central parts being preferred for this purpose. Stairwells could also be taken into consideration for the purpose, the advantage here being that already existing regulations required the walls to be of masonry, strong, and proof against fire and smoke, so that only structural alterations were necessary for them to meet the technical specifications for air raid shelters. The main modifications required here were to sink the stairwell somewhat deeper, to reinforce the outer walls and improve the existing supports, and to provide a protective cover and catch ceiling. An irremediable disadvantage was, however,

393 that such shelters provided only conditional protection against direct or near hits, and that if they were destroyed heavy casualties resulted.

There can be no doubt that hundreds of thousands of people owe their lives to the existence of air raid shelters.

It is only natural that the shelters constructed in houses could not serve their intended purpose in the case of large-scale attacks or in the event of large area fires.

394 The important requirement in such cases was to move the population out of the threatened areas as speedily as possible and as a precaution against such eventualities special public air raid shelters had to be constructed for the population of particularly endangered districts of each town.⁵²⁸

Special measures were necessary to enable persons to escape from their shelters if these collapsed or became surrounded by fire. The measures involved here were of a structural nature, and everything possible was done to take them. The important points were as follows:

bb. The Establishment of Rescue Services.

Here, the following possibilities existed:

(1) The Breaking of Openings through Party

walls. In most cases openings into adjacent cellars proved the best emergency exits from shelters. The best solution here was found to be a series of openings

providing an escape route through all party walls of an entire block of buildings. For this reason steps were taken to create more such wall openings in cellar walls wherever it was possible by this means to improve and increase the escape routes.

(2) Criss-Cross Passage System Connecting Houses underground. Wherever possible, measures had to be taken to construct such underground systems connecting various blocks of houses and thus forming a complete network of escape route with outlets, if at all possible, in open areas. Wherever the top surface of such passages was exposed to damage by falling houses, the roofs had to be adequately reinforced. The areas thus endangered was that extending as far as two-thirds of the nearest building or buildings.

(3) Underground Passages between Houses as Air Raid Shelters. Where only unsuitable or inadequate cellar space was available for use as air raid shelters, the passages described under (2) above were to be developed as air raid shelters, which provided a possibility to improve and increase the shelter space already available. The layout of such "shelter" passages depended on local circumstances. They were to have at least one

529. See VIII, a, 5, cc, below.

turning at right angles.

(4) Exits Proofed against Blocking. Emer-

gency exits had to be as safe as possible against the possibility of being closed by falling debris. A particularly good solution here was found to be to have the exit outside the range of debris if the house from which it led should collapse. The following specifications applied in the construction of emergency exits of this type:

(a) The passage was to have at least one sharp right-angle, turning.

(b) The exit was to be safe against debris which could close it.

(c) The dimensions had to be large enough for an adult to crawl through it easily. Wherever possible it was to be large enough for an adult standing upright or stooped.

5. (5) Emergency Exits.- Giving Direct Ac-

cess from a Building to the Open Air. If it appeared necessary to increase the number of emergency exits, it was permissible to create such exits giving direct access from a cellar, and in very special cases even from the shelter itself, to the outside, provided this would not expose the shelter to the threat of blast pressure or the effects of incendiary bombs.

If necessary, steps could be taken to render already

395 existing emergency exits safer.

396 As previously mentioned, air raid ~~shelters~~ constructed in cellars proved a sound solution wherever escape routes existed and could be kept open. With the increasing frequency of large-scale attacks, large area fires, and fire storms, however, cellar shelters of this type could no longer provide adequate protection in closely built up areas of cities. For this reason an entirely new concept has developed, which had its beginnings already in the last phases of the war and has become more prevalent since 1952. The basic feature of this new concept is "a complete rejection of the use of cellar space or the adaptation of such space to serve as shelters. The shelter room has now become a shelter building, literally speaking, a building standing alone, enclosed on all sides by buckle-proof highly stable walls, one might say a small shelter bunker."⁵³⁰

In view of the effectiveness of modern weapons, the cellar type of air raid shelter will still be of considerable importance in sparsely built up areas. In closely built up city areas, however, it would provide only very limited protection and would represent an added hazard for its inmates.

⁵³⁰. "Der Schutzraumbau," Professor Dr. Ing. Wiendieck, in "Ziviler Luftschutz," Vol. 12/1954, Verlag Gaßschutz und Luftschutz, Koblenz.

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cc. Public Air Raid Shelters. Initially knownas "Public Collective Air Raid Shelters (oeffentliche Sammel-schutzraeume)"⁵³¹ ^{to be} these were distributed throughout city

districts in a ratio proportionate to normal and peak traf-

fic densities. As a start, the cellars of public buildings,

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underground tunnels, storage cellars, and the cellars of

large private dwellings were taken into consideration for

the purpose. Where such spaces were not available, special

shelters were constructed, primarily in passive air defense

localities of Category I. The technical specifications

corresponded to those for other air raid shelters.

In the beginnig these shelters were by no means bomb proof, and provided protection only against near hits, the exception ~~excusion~~ being where they had a natural covering of earth.

1. Bunker Type Air Raid Shelters. With the increasing caliber of the bombs used, more emphasis was placed on the construction of bomb proof shelters. The decrees and directives issued on this subject were consolidated in the compilation "Regulations for the Construction of Bunker Type Air Raid Shelters (Bestimmungen fuer den Bau von Luftschutz-

Bunkern)"⁴³²

Volume I of the compilation was organized under the headings

Background, Planning, and **Day** Out

397 Volume II under the heading: Structural Development
 Volume III " " " Ventillation, heating, cooling.
 " IV " " " Water supplies and drainage.

It is not possible to enter into details here, but a brief summary of the more important regulations will be found in the Karlsruhe Document Collection.⁵³³

In efforts to exploit all possibilities to provide protection for the civilian population, military buildings were also used. Thus, large shelters with separate entrances were built into the AA gun towers in Berlin for use by the public. These towers also contained medical stations in which even complicated surgery could be carried out under bomb proof protection.

The following experience was gathered on the subject of bunker type air raid shelters:

The number of such shelters available in Germany was naturally nowhere near adequate. They were established primarily in residential areas which had no cellars at all or cellars which were not suitable for improvement as shelters.

Care had to be exercised to select a building site for the bunker at a safe distance from high houses.

A large fire surrounding a bunker seriously endangers proper ventillation. In one such case, that of a large-scale attack against Hagen, in Westphalia, a shortage of oxygen

occurred and th

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398 occurred and the air sucked in through the ventilators
was considerably overheated.⁵³⁴

Broad and easily accessible ascents and descents must be provided, otherwise injuries might easily occur during crowding. Therefore, it might be wise to examine the advisability of providing covered approaches to the shelters.

Generally speaking, bunkers were built in the cube form. In a few cases the heavier bomb calibers used by the enemy later in the war pierced the roofs of some bunkers. This was because the bunkers erected during the first few years of the construction program were not designed for resistance against such heavy calibers. In part it was also due to the necessity to use steel sparingly in the construction.

In all cases ~~shelter bunkers~~ conically shaped shelter bunkers proved adequately resistant. An example here is the Winkel design. In the air attack which resulted in complete destruction of the gasoline works of Scholven-Buer, for example, the only structure which escaped destruction was the air shelter tower.⁵³⁵

It is a categorical necessity for each shelter bunker to have its own independently operated electricity system for lighting purposes.

During the initial stages, shelter bunkers were subdivided into individual compartments, each with sleeping

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spaces for six persons, and the local passive air defense chief specified which families and persons were authorized to use the nearest bunker, and were allocated their specific compartment there.⁵³⁶ This arrangement had to be discontinued when the number of persons seeking shelter became too great after commencement of the large-scale attacks. Special arrangements had to be made for administration in each bunker, and separately for the medical compartments, as well as for the guarding and servicing activities.

A shelter bunker warden was appointed by the local passive air defense chief for each bunker with the privileges and missions of a passive air defense warden as defined by the articles of the Civil Air Defense Act. The warden assigned the various assistant personnel and messengers their duties, and was responsible for the maintenance of law and order during entrance to, use, and exit from the bunker.

The operational personnel by whom he was assisted constituted a shelter guard group with the mission of damage control action in houses in the close vicinity.

The local passive air defense chief also appointed a bunker administrator, who was responsible for the structural

400 maintenance, servicing, and supervision of the bunker, including all equipment.

2. Air Raid Shelter Tunnels. With the increasing frequency and size of air attacks it became increasingly necessary to give the development of quickly available even if only conditionally safe shelters preference over the development of completely safe shelters, a matter for the future, but at the same time to exploit all means for the development of the conditionally safe type. The most economic form of protection was undoubtedly that afforded by tunnels and shelter trenches. The factor in favor of tunnels was the complete protection they provided, that in favor of shelter trenches the short time required to provide at least conditional protection.

No standards were available to conjecture the scope of destruction which air warfare would cause, so that the problem of tunnel shelters was not given enough consideration prior to the war. Some experience was available only in mining regions, where tunnel shelters were prepared. In like manner existing natural caves were also exploited for this purposes, although there was no large-scale planning in this field.

"Shelter Tunnels. provide the greatest protection.

the costs are estimated at approximately DM 400, or

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531. See Section VI: ~~af~~ "Schutzraeume," of "Verlaeufige Orts-
anweisung fuer den Luftschutz der Zivilbevoelkerung,
p. 18.
532. For July 1941 text see Karlsruhe Document Collection.
533. Karlsruhe Document Collection: "Bombensichere Luftschutz-
bauten (Luftschutzbunker), by Hans Worringen, 1955.
534. See pp. 90-91 of source quoted in Footnote 411.
535. Air Photo Scholven-Buer.
536. Karlsruhe Document Collection: ~~XXXXXXXXXXXX~~
"Bombensichere Luftschutzbauten fuer die Bevoelkerung,"
Rd.Erl.R.d.L.u.Ob.d.L., 31 May 1941 in "Luftschutzrecht,"
by Darsow-Fokken, 31 August 1943 Edition.

400 roughly 450 Dollars per person to be protected. In contrast with other types of shelters the holding capacity is practically unlimited. Under a long-range plan a shelter tunnel can be prepared and can later be extended without in any way detracting from the protective capabilities of the initially prepared sections."⁵³⁷

Possibilities exist in almost all parts of Germany for the development of shelter tunnels. Particularly favorable conditions exist ^{where} there are mountains with solid but easily cut rock, as is the case in the Saar region. There air raid shelters were in existence since 1941, which were so large that in many cases the whole population of a locality could find protection in them, and the total holding capacity afforded complete protection for many hundreds of thousands of persons.

Similar geological conditions exist in other parts of Germany. One of the fortunate peculiarities of Germany is that mountains are to be found practically everywhere, with the exception of the northern parts and the northeastern regions, where the air threat was relatively small. In all of these mountain areas it was possible to create shelter tunnels in solid rock.

The failure to create shelter tunnels on a much larger scale than actually took place in suitable areas right at

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401 the beginning of air warfare was due in reality to only one reason. This reason was a general lack of familiarity with mountains and the tunneling processes. The "Regulations for the construction of Shelter Tunnels (Bestimmungen fuer den Bau von LS-Stollenanlagen)"⁵³⁸ in essence stated as follows:

For reasons of safety as many exits as possible were to be provided, so that one large tunnel project was to be given preference over a number of small ones.

Shelter tunnels were to consist of the following subdivisions: Entrances, gas locks, the actual shelter spaces, and machine spaces. Entrances: Each shelter tunnel should have at least three entrances, each with a gas lock. The entrances were to be at least 33 yards apart.

The sites for shelter tunnels were to be so selected that there would be a bomb-proof cover.

If at all possible, water should be laid on from the public water mains.

If there was not sufficient slope for natural drainage, for example in deep tunnels, precautions were to be taken against the possibility of the tunnel being flooded if the water pipes were destroyed or damaged. Special precautionary measures had to be taken against this eventuality.

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According to local conditions, the water supply could in some cases be insured by means of wells. As a precaution against possible failure of other water supplies, an emergency supply source under bomb-proof shelter was to be provided in the form of wells or storage reservoirs.

Electricity was to be taken from the public network, if possible from a number of separate points and from at least two separate supply stations. Where two electricity supply networks existed from separate sources, the second network was to be used for the second source. Regulations provided for the installation of a power plant for use in emergencies. If there was no possibility to procure a power plant, emergency lighting was to be ~~provided~~ provided by means of electric torches, candles, etc.

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Many of the mistakes made during the first years of warfare in the construction of air raid shelter tunnels were due to a false conception of their purpose. The construction of shelter tunnels was not a mining project but a construction project. It was naturally not possible to dispense with the advice of mining personnel.

537. "Der Schutzraumbau," Professor Dr. Ing. Wiendieck, p. 303, in "Ziviler Luftschutz," Vol. 12, 1954, Verlag Gassechutz und Luftschutz, Koblenz.

538. Karlsruhe Document Collection: "Bestimmungen fuer den Bau von LS-Stellenanlagen, Fassung Juli 1943.

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The problem most discussed in public was that of the minimum thickness of cover required to prevent penetration by bombs. Therefore it was one of the first on which definitive regulations were issued. Unfortunately it was necessary in many cases to depart from the prescribed minimum thickness of cover, since the depth at which a tunnel could be driven depended largely on the local geological conditions.

Within cities the construction of tunnel shelters has significant advantages over the construction of bunker type shelters. Quite apart from the factor of easier construction, it requires considerably smaller expenditures in raw materials and offers the possibility to economize in cement and gravel, and almost completely do without iron or steel and pit timber. The construction does not place as heavy a burden on the transportation system as does the construction of bunkers. In the third and fourth years of warfare these advantages were ~~enough~~ significant enough to recommend promotion of the program to build tunnel type shelters in preference to other types.

The Construction of Tunnel Type Shelters for Industrial Concerns. The passive air defense requirements here could naturally only be met to the extent made possible by the available building capacities, and took the form of protection of personnel and industrial installations against bomb fragmentation, falling debris from buildings, and incendiary bombs,

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403 and carefully planned camouflage of all newly established
installations.

404 ^{in the solution}
To the disadvantage/~~that~~ these installations were only
imperfectly protected against air attack, must be added the
the time always lost before newly established installations
can commence producing.

The disadvantages of above-ground relocation (time and
building requirements and lost output) had led, even at a
time when opportunities still existed for precautionary
measures, to relocations in underground premises. This applied
for example to the bomb-proof construction of a number of
underground electric power stations, in particular the opera-
ting and machinery installations involved at hydroelectric
works, where these installations were in some cases built
into the walls of dams and in other cases into mountain sides.
The advantages of installations thus absolutely safe against
the effects of air attack were obvious. There was no fear of
any interruption by air reports or air alerts and no wastage
due to interruption of manufacturing or other processes. Work
could proceed day and night, and what was most important,
there was no fear of the necessary installations and so
forth being destroyed.

Isolated protests were made against the fact that the

405 employees would have to work underground. Undesireable as this seemed from the humanitarian and health viewpoint, the primary consideration during war was to have safety and preservation of the armament industry. Technological facilities, which permitted proper ventillation, air conditioning, and neon lighting made it possible to provide safer and more healthy working conditions than were enjoyed by millions of miners.

By 1943 the following experience was available on the subject of underground sites in tunnels:

(1) The funds required to prepare manufacturing sites in bomb-proof tunnels were barely higher than those for other relocations, the expenditure in controlled building materials in short supply were lower, and the overall expenditures for a relocation were barely higher.

(2) The time required for construction could be measured in weeks and was less than that for a corresponding aboveground building, even if the latter was only of a temporary nature.

(3) Work could commence at any time on the construction and could continue throughout the winter and practically without interference by enemy action.

The establishment of industrial installations in tunnels naturally also had disadvantages, but these were usually

405 negligible. Moisture was generally considered the most adverse factor. The moisture in shelter tunnels was not only unpleasant for those employed or seeking shelter there, but also caused deterioration of the equipment and machinery, and so forth. Countermeasures therefore presented a serious problem of general interest.

The problem of shelter tunnels is dealt with copiously in present day professional literature.⁵³⁹ The points of a technical nature dealt with are:

- (1) Shelter space and roof thickness.
- (2) Planning and execution of tunnel construction, and the necessary rescue or medical, machine, prewarming, and other separate spaces.
- (3) The construction of concrete tunnels, using rigid and flexible steel arches.
- (4) Construction of approach shafts to deep tunnels.
- (5) The outfitting of shelter tunnels.

A comparison of the advantages and disadvantages of the various types of shelters shows that shelter tunnels have the highest coefficient of safety at a relatively low cost.

Covered
3. Air Shelter Trenches. The increasingly serious shortages in building machinery, materials, and labor gave added significance to covered shelter trenches, since these could be constructed with the least expenditure.

The Reich Minister for Aviation and Commander in Chief of the Air Force, through Air Force Inspectorate 13, issued instructions on the subject in "Regulations for the Construction of Air Shelter Trenches (Bestimmungen fuer den Bau von LS-Deckungsgraeben), the last revised edition of which appeared in March 1943.⁵⁴⁰ It had been found very soon that ^{covered} shelter trenches provided particularly effective protection if they were constructed in accordance with regulations. A particularly practical and time saving method was the use of prefabricated sections of reinforced steel. The public were called upon to assist in the construction.

The construction of such shelter trenches was prohibited in debris-endangered areas.^{57D} In cases where this was unavoidable, roof reinforcements had to be built in.

An important consideration was the proper placing of entrances and emergency exits, and the use of two layers of bricks between the sand cover was found highly effective.

Heating and lighting presented particular problems in covered shelter trenches. The use of electricity as a rule was intended for lighting, and the fact that no chemical weapons were used in the war made it possible to heat by

539. "Der Schutzstollen und die verschiedenen Arten seines Ausbaus," Diplom Bergingenieur Fritzy Ruhe, Duisburg, in "Ziviler Luftschutz," Volume 10/1955, Verlag Gassenutz und Luftschutz, Koblenz.

540. Karlsruhe Document Collection: Photostat copy of "Bestimmungen fuer den Bau von LS-Deckungsgraeben, Fassung Maerz 1943."

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A large share of the mission of constructing covered air shelter trenches was assigned to Organisation Todt, a paramilitary constructional engineering organization. This organization had received instructions to design and develop various types of shelters.

On the basis of experience gained on all front, Organisation Todt published pamphlets on the subject, which gave directions for use in practice. The first such pamphlet published under the title "Covered Air Shelter Trenches (Luftschutzdeckungsgraben)⁵⁴² contains a profusion of examples, together with illustrations and measures.

Before the experience gained in large-scale attacks brought the problem of covered shelter trenches into the foreground, such trenches had served solely as a substitute for non-existent or inadequately large standard air raid shelters. In all areas where inadequate or no cellar space was available, or where the cellars were not deep enough for the construction of shelters, the practice had been to construct covered trenches, the requirement being that they were to provide protection equal to that of the normal shelters. This required quite considerable construction expenditures. With the increasing frequency of large-scale at-

541. See VIII, a, 5, bb, below.

542. Karlsruhe Document Collection: Photostat copy of "Luftschutzbauten--LS-Deckungsgraben."

407 attacks against cities and closely populated areas, such as
cantonment camps, the practice became increasingly general
to regard such trenches as a substitute for normal air raid
shelters which had become unusable. This circumstance vigor-
ously promoted the construction of such trenches.

The existing regulations on the subject required a
highly perfected structure, which presupposed the availability
of adequate time, personnel, and materials for the purpose.
The growing frequency of continuous heavy attacks, however,
made the speedy construction a paramount necessity, and the
seriously critical personnel and materials supply situation
resulted in the use of expedients to the limit of prudence.

408 It was a logical requirement that even a makeshift
covered shelter trench had to provide its occupants with
what its name implied, shelter and protection. Therefore,
even such trenches had to meet certain standards of suit-
ability, which may be formulated approximately as follows:

- (1) The shelter trench had to be at a safe distance
from buildings
- (2) It had to be easily accessible
- (3) It had to be adequately large.

The requirement of safe distance was met if the trench
was so far from any buildings that it could not be endangered
by falling debris or fire from those building if they were
struck by bombs. The law prescribed a minimum distance of

408 equal to at least two-thirds of the height of the nearest building.

The requirement of easy accessibility was met if the trench was not too far from the living quarters of those who would use ^{them}, and if the approach to it was free of fences or other obstacles, on condition that it could be approached from various directions, and had the largest possible number of entrances.

There can be no doubt that a trench system consisting of a number of separate sections was preferable to a system of only one trench with few entrances. The possibility to enter the trench by a large number of entrances averted the danger of massing and delays, particularly when the trench was to be used at night.

The question of whether open or covered trenches were better was decided beyond argument by experience gained in large-scale attacks in favor of the covered type, since the roof provided protection not only against fragments from antiaircraft shells, but also against flying ^{burning} ~~burning~~ debris from large fires, and against inclement weather.

However, the necessity for speedy construction, shortages of material, and other circumstances in many cases made it necessary to first do without any cover. In other cases

409 the trench was given a roof of boles covered with a layer of earth; the elasticity of such roofs made them relatively resistant to penetration. In still other cases, the trenches remained open ^{in parts} to enable occupants to keep nearby houses under observation so that they could take immediate action in the event of any of the houses being struck by incendiary bombs.

The experience gained in years of warfare on the effectiveness of shelter trenches against the weapons used in air attacks proved time and again that they afforded a high degree of protection.

On the basis of the latest experience, the Reich Minister for Aviation and Commander in Chief of the Air Force, through Air Force Inspectorate 13, in April 1944 published certain modifications of the existing regulations, roughly as follows:

Newly developed tactics of air attack, particularly the frequently employed method of simultaneous mass bomb release (Feppichetward) have greatly increased the probability of hits with ⁱⁿ an area under attack. This has also increased the probability of hits on air shelter trenches. In planning shelter trenches, provisions must therefore be made to spread the persons seeking shelter over a large area by keeping the individual parts of a trench system as far apart as possible, each part if

410 possible to contain not more than fifty persons.

In the matter of structure, the prefabricated steel reinforced sections for trench construction have proved superior to other methods of construction.

410 Timber construction has also proved an effective protection, particularly where nailed plank frames ^{and} fascine revetments are used.

Another important factor to improve the protective quality of shelter trenches is to have them if at all possible completely below the natural surface of the ground, and to have them in ground as level as possible, with a grade of at most 1:2.

So much for the supplementary regulations issued by the Reich Minister for Aviation and Commander in Chief of the Air Force on 28 April 1944.

The experiences of war proved the usefulness of the most simple and oldest type of air raid shelter, the shelter trench, in every respect.

6. Protection against Bomb Fragments. From the start the matter of providing protection against bomb fragments was one of the important missions in structure for air shelter. The necessary regulations on this subject were issued by the Reich Minister for Aviation and Commander in Chief of

570

410 the Air Force, through Air Force Inspectorate 13. Together with construction drawings these regulations dealt with the following subjects:

Bomb-fragment-proof walls of buildings and selfsupporting bomb-fragment-proof walls.

Measures to render the walls of existing buildings proof against bomb fragments

Safety devices for wall openings

Safety devices for emergency exits

Makeshift protection against bomb fragments.

The subject of protection against bomb fragmentation gained steadily in importance throughout the war. Protection had to be provided to preserve stationary cultural monuments which could not be removed for safekeeping to less endangered areas. In the case of historical building and monuments it was usually possible to provide adequate protection by means of sand bags or a protective scantling, measures which were also taken, incidentally, under orders from German authorities to protect cultural monuments in the German-occupied territories. Furthermore, protection was essential for humans, for manufacturing and other installations, and for machinery. A legal basis for all necessary measures in this field was also provided in the Civil Air Defense Act and the various decrees implementing that act.⁵⁴⁴

411 No generally valid statement can be made on the best and most practicable methods to provide protection against bomb fragmentation under varying circumstances. Under the German system such measures were adapted currently to the latest experience and local conditions, and had to keep pace with the development of the weapons used by the enemy in air attacks.

In the field of structural protection, for example, the increasing use of heavy and superheavy bombs created the necessity for protection not only against bomb fragmentation but also against the forces of air pressure.

Many measures considered adequate when the war commenced had to be improved during the war.

In constructing work for protection against bomb fragmentation, preference shifted steadily in the direction of permanent structures. The temporary structures used at the beginning of the war because of the necessity for speed, and because of the lack of building materials and experience, were generally avoided later in the war. Structures of the temporary type, which became damaged and required repair because of exposure to weather as time passed were replaced by permanent type structures.

The best expedient for protection was a ^{revetment} ~~covering~~ of firmly tamped sand or soil with a thickness of approximately 4 feet. This method produced good results at airfields, where ~~545. See II, d, above.~~

412 it was used to protect machinery installed in the open.

In both large and small industrial installations the subject of protection against bomb fragmentation grew steadily in importance. On the basis of the directives issued by the Reich Minister for Aviation and Commander in Chief of the Air Force through Air Force Inspectorate 13 and on experience reports received, the Board of Industries published regular bulletins on the subject together with many illustrations and much technical data.⁵⁴⁵

The problem of what materials to use was decided from case to case according to what was to be protected. The following are the methods used which wartime experience proved to be sound.

The permanent methods used included the use of steel reinforced concrete, ordinary concrete, brickwork,

Temporary methods included the use of soil, sand, gravel, and crushed rock.

(1) Brick masonry provided particularly effective protection and proved suitable for most purposes. In contrast with other types of building materials, bricks were relatively easy to obtain throughout the war. Brick walls could be used in all cases where there was no need for the occasional temporary removal of the protection for

⁵⁴⁵ For an example see Karlsruhe Document Collection: Photostat copy of "Schutzmassnahmen ausserhalb der Gebaeude."

412 repair and maintenance work on machinery, where the walls could remain in place without any serious disadvantages after the war, as was the case with separating walls, window protection in yards, bricked-in windows, etc.

(2) Dry-Stacked Brick Walls. These were walls of unmorticed bricks. For protection against bomb fragments they were as effective as morticed walls, against blast effect they even had advantages because of their greater elasticity. They could be built speedily anywhere, could be removed just as speedily to facilitate repair work, and then just as speedily replaced. Walls of this type were found to give excellent protection even against bombs exploding in the immediate vicinity.

Brick walls of this type proved satisfactory wherever temporary removal of the protection might become necessary, and where only temporary protection was needed. They required no supports up to a height of two meters.

(3) Concrete and Steel-Reinforced Concrete. Walls of this type, if built in the minimum thickness for protection against bomb fragments were not as resistant against blast force as dry-stacked brick walls, since they lacked elasticity. Because of their large rigid surfaces and relative thinness the danger existed that they would be blown in by bomb blast pressure and might damage the object they

413 were to protect. Concrete walls erected to serve as protection against bomb fragments needed adequate supports.

(4) The use of prefabricated concrete wall sections proved more practicable in industrial works than continuous walls. Whenever the necessity arose for repairs to the machinery protected, the wall sections could be lifted out separately by a crane. The sections had to be wide enough to stand firmly and it was found wiser not to anchor them in the ground.

414 (5) Iron was found to be less effective than had been assumed at the beginning of the war. Wooden structures also were to be used only in exceptional circumstances, since walls consisting exclusively of timber afforded little protection, and since the timber first had to be rendered fire-proof.

All windows and doorways to premises in which there were humans or machinery had to be secured against bomb fragments. If protective walls were erected inside a building, regulations required that they must be securely anchored or supported to prevent their being blown in by blast pressure. The bomb fragment protection measures were not to interfere with the proper ventilation of the premises.

Emergency exits through the outer walls of buildings had to have protection by fragment proof walls.