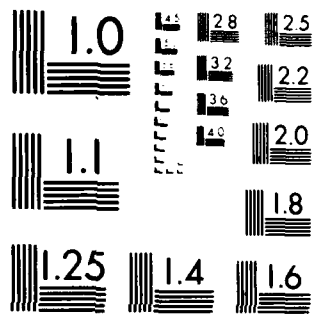


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TECHNOLOGY AND EQUIPMENT OF THE CHEMICAL SERVICE
ABOARD SURFACE SHIPS

[Bose, H.-J.; Technik und Ausrüstung des Chemischen Dienstes auf Ueberwasserschiffen; Militaertechnik, No. 4, 1979; pp. 214-215; German]

The crews of ships and boats of the DDR Navy can successfully accomplish /214* the mission assigned to them in modern combat only if their combat readiness is ensured under the conditions of the employment of means of mass destruction.

Since the introduction of means of mass destruction into the armament of NATO forces, the resulting tactical and technical requirements in the technology and equipment for protection of the crew from the effects of the means of mass destruction and for the elimination of its aftereffects have been achieved in constantly increasing quality.

As a rule, ships and boats are outfitted with facilities and equipment for nuclear and chemical reconnaissance and warning, with filter ventilation systems, chemical decontamination systems, deactivation systems, and water protection systems. In addition, they have protective spaces for the crew, spaces for sanitary treatment of the crew, and sluice-down systems, which will not be treated in this article.

1. Facilities and equipment for Nuclear and Chemical Reconnaissance and Warning

The specially-designed facilities and equipment for use aboard ship signal optically and acoustically:

- the presence of radioactivity in the air and in the water,
- the nuclear radiation dosage on the upper deck,
- the nuclear radiation dosage absorbed by the crew at the most important battle stations,
- the exceeding of set threshold values for a specific nuclear radiation dosage,
- the presence of chemical warfare agents in the air, and
- the degree of deactivation and decontamination.

The type of nuclear radiation warning device to be installed and the number of automatic chemical agent indicators are determined by the type of ship (size and missions).

The values determined by the nuclear radiation warning device are displayed on screens at the battle station of the chemical service. Redundant indicator devices, i.e., signal transmitters, are located on the bridge of the ship. On the basis of these measurements and after exceeding a threshold value, protective measures for the ship determined by a pulse transmitter, such as an alarm device, filter ventilation device, water protection device or the hermetically sealing equipment, can be automatically put into operation.

*Numbers in right margin indicate pagination in the original text.

2. Filter Ventilation System

The purpose of the filter ventilation system is to provide the crew below deck with air purified of radioactive material, as well as chemical and biological agents. Thereby an excess pressure in the ventilated spaces is assured which hinders the penetration of contaminated air through the exhaust apertures. Whereas surface ships were previously equipped with only radioactive filters (coarse and fine filters), today they are outfitted with adsorption filters (protection against toxic agents and radioactive materials).

Ventilation of the spaces through the filter ventilation system requires a set degree of hermetic sealing of the spaces. Normally all occupied battle stations, recreation spaces and quarters, and the necessary connecting passages are ventilated. The engine spaces are ventilated by filter ventilation systems, for which the air must be drawn from the outside and from the engine room itself.

It is of prime importance that filter ventilation systems on surface ships be normally coupled with the forced-air ventilation system, essential for these ships. This means that the filters in the systems are of necessity included in the overall ventilation system of the ship. So viewed, favorable technical and economic conditions exist for the employment of filter ventilation systems aboard.

The required output of the filter ventilation system is not only dependent on the volume of air required for the crew. Often it is determined by the heat radiated by the most diverse facilities and equipment in the ship's interior to the individual battle stations. Therefore, air conditioning is installed where there are intensive heat radiators and an appropriate uprating of the filter ventilation system is not economically justifiable. In regard to the excess pressure which the filter ventilation system produces, generally only a limited hermetic sealing of the ventilated spaces is necessary. However, high demands are placed on the hermetic sealing of selected spaces (protective spaces), which must assure protection of the crew for a specific time without use of the filter ventilation system. That can become necessary in cases of damage or with the use of unknown chemical agents.

The exhaust apertures necessary for the functioning of the filter ventilation system in the ventilated spaces are reduced to a minimum, especially to shorten the time for the closing of these apertures. The exhaust apertures are closed with valves, whose setting ensures the required excess pressure in the spaces. The filters are accommodated in spaces which are substantially protected from the effects of hostile weapons and obviate the influence of spindrift and moisture. It must be possible to replace the filter elements safely and easily while observing safety regulations, and they may not get dirty in an unused state. Measurement devices and indicators make functional control of the system possible, as well as measurement of the stress level on the filters. /215

3. Decontamination and Deactivation Systems

Surface ships are outfitted with decontamination and deactivation systems to obviate the effects of hostile employment of means of mass destruction. They assist in the special treatment of weapons and equipment of the ship.

With these systems, the special treatment is assured in a time appropriate to the tactical requirements, when the entire upper deck and the superstructure must be accessible.

The decontamination and deactivation system includes:

- decontamination and deactivation facilities,
- decontamination and deactivation recesses,
- piping with fittings.

The number, size, and arrangement of decontamination and deactivation systems aboard can vary. They are dependent on the size of the ship and on the location of the pressure tanks. The fluid for decontamination and deactivation necessary for the special treatment is produced in these tanks. Built-in mixing devices and warm water supply connections accelerate production of the fluid.

On modern ships the tanks are installed in the superstructure or below deck. They are thus protected from damage by hostile weapons and can be serviced below deck. The fluid flows through pipes to the distributors (decontamination and deactivation recesses) on the upper deck. Here are located the necessary hoses, plunger barrels, and brushes with which the fluid is delivered to the affected upper deck. Brushes are used to mechanically remove the contaminants from the surfaces. Each distributor usually has connections for three to five work hoses.

4. Water Protection System

The primary task of the water protection system on surface ships is to sprinkle continuously, for a certain length of time, i.e., to create a flowing film of water, all of the decks, superstructure, facilities and weapon systems on the upper deck. This will prevent radioactive material, chemical or biological agents in solid, liquid or aerosol form from settling on the upper deck.

The water protection system also has the task of washing down a ship already attacked (partial special treatment), flushing away the residues of complete special treatment, preventing the spread of fire when incendiaries are used, and reducing the general thermal field of the ship.

The water protection system can be set up as a sprinkler or sprayer or combination of both types. The spray setup produces a screen or curtain of mist over the entire ship. The drawbacks are the obstruction of visual and optical surveillance, interference with the use of weapons, and the increased demands placed on the feed pumps for the required amount of sea water.

A sprinkler system ensures a constant, cohesive film of water on all decks, on and along the superstructure. This is achieved by simple pipes with suitable orifices for discharge of the water. So that the requisite effectiveness is available, the appropriate amount of water for each surface to be sprinkled is calculated, which depends on the shape of these surfaces and their position with respect to the course of the ship. The disadvantage of this system is that sprinkler pipes cannot be installed on all outer surfaces of the ship.

The sprinkler system generally has priority. Jets to produce a water screen are installed where sprinkler pipes, because of the disposition of weapons and marine equipment, cannot be installed on the upper deck. Pumps designated for other purposes, i.e., bilge pump system or fire extinguisher system, are used for the primary supply of sea water for the water protection system. Auxiliary pumps are provided only if their capacity is not sufficient.

A subdivision of the sprinkler system into individual sections, independent from one another, is desirable.

The recently-installed universal water protection systems make it possible to mix sea water and the deactivation material together. In this case, surface-active materials lead to a better sprinkling of the contact surface, since complexing agents bind the most important radioactive elements through ion-exchange reactions. The devices for the mixing must ensure a 0.05-0.1% concentration of the deactivation material in sea water. The significance of water protection systems aboard surface ships is that on sprinkled surfaces about 98 to 99% of the radioactive deposit is rinsed away at once.

5. Final Observations

In spite of the aforementioned equipment for protection from means of mass destruction, all crew members of surface ships are outfitted with protective clothing, which in addition to the actual protective function has other naval tasks to perform.

Additional auxiliary portable devices are available for nuclear radiation and chemical reconnaissance, as well as dosimetry. For partial special treatment, surface ships are equipped with various portable devices, located at open battle stations.

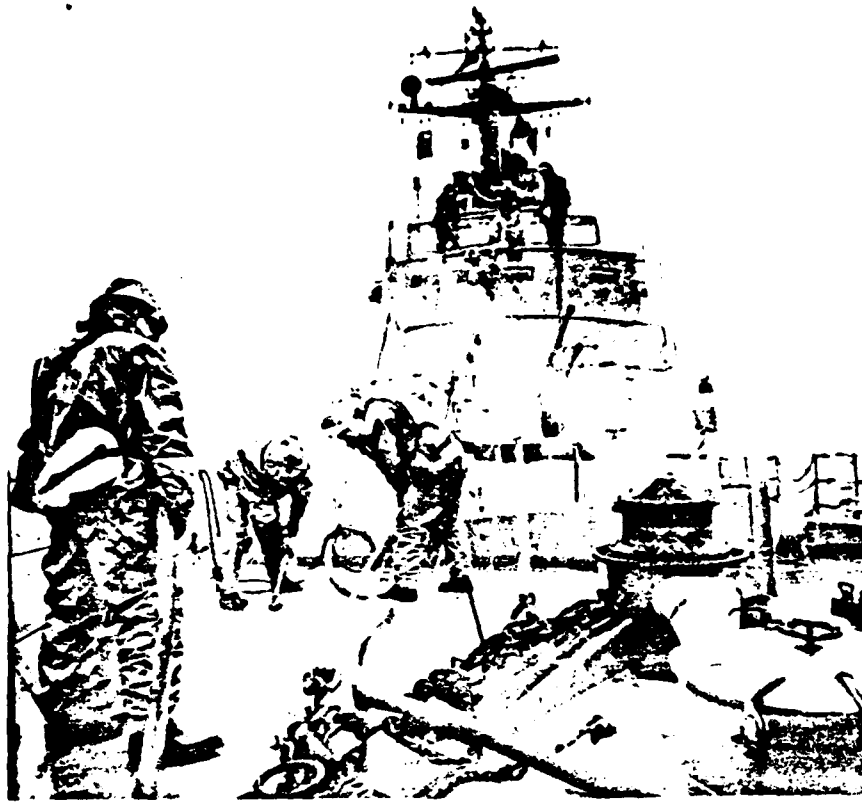
Next to the "chemical service" battle station, there are special storerooms for the equipment and resources of the chemical service. The battle station and storerooms of the chemical service lie as a rule near the decontamination and deactivation facilities and the mixing device for the water protection system, in order to be able to quickly operate and monitor this equipment.

It can be confirmed conclusively that the design and power conditions aboard surface ships offer relatively favorable prerequisites for employment of the technology and equipment of the chemical service for protection from the effect of radioactive substances and chemical agents. By sensible and economic integration of the technology into the general technical systems of the ship and use of the latest discoveries and experience, an effective protection of the crew from radioactive substances and chemical agents can be ensured without jeopardizing the performance data of the current ship type and accomplishment of combat missions

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Special treatment on the upper deck

Determining the activation
level after partial and full
special treatment on board

