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USSR REPORT

MILITARY AFFAIRS

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DOSAAF AND MILITARY COMMISSARIATS

GROUND FORCES

GERMAN SOURCE ON TANK DEVELOPMENT, 1950-1980

Frankfurt/Main SOLDAT UND TECHNIK in German No 2, Feb 82 pp 68-77

[Article by Rolf Hilmes: "Thirty Years of Battle Tank Development 1950-1980: Part I"]

[Text] In this issue we begin the first part of a series of articles dealing with international battle tank development in the period from 1950 to 1980. This will provide the interested reader with an overview of the developmental process and associated technical problems during this period. The individual articles will deal with the following topics:

Part I: Development Overview
Part II: Component Technology Development
Part II/1: Fire Power-Determining Assemblies
Part II/2: Mobility-Determining Assemblies
Part II/3: Survivability-Determing Elements
Part III: Technical Problems of Individual Development Phases
Part IV: Evaluation of Various Development Philosophies
Part V: View of Future Possibilities and Limits of Battle Tank Development.

Part I: Development Overview

It is particularly interesting to view the last 30 years from the standpoint of tank technology since three generations of battle tanks were manufactured during this time. The following analysis will explain and clarify development progress in component technology, technical problems associated with development and the configuration philosophy of the countries concerned.

For a start, it should be remembered that battle tanks serve primarily to impart mobility in terrain to a flat trajectory weapon and are also to make use of weapons possible under definite selfprotection conditions. A certain internal dynamic has arisen in the course of development and there has been a mutual interaction as concerns the design of individual battle tanks. In concrete terms [these] are:

- the firepower of any model is, among other things, concentrated against the armor of the hardest enemy target -- the battle tank;

- armor protection of a given vehicle is influenced, among other things, by the weapon effectiveness or ammunition effects of the enemy tank gun.

Corresponding relations between active and passive system characteristics may be easily recognized in the course of tank development.

With each new vehicle development, the attempt is made to achieve a superiority on the battlefield over the expected enemy model. In the last 30 years great efforts have been made in the spirit of this development, in particular to achieve visible performance increases and improvements in the following areas:
- performance increases in the area of firepower:
- - increase of reconnaissance performance by day, night and poor visibility,
- - decreasing reaction time for firing the first shot,
- - increasing hit probability in combat at the halt and on the move.
- improvements in the area of mobility:
- - increase of powerplant-dependent mobility,
- - increase of suspension-dependent mobility.
- increase of crew and overall system survivability:
- - decrease in detectability,
- - decrease in probability of being hit,
- - increase in effectiveness of ballistic and ABC protection,
- - optimization of component configuration.
- improvement in tank crew peripheral conditions:
- - optimized layout of operating panels,
- - decrease in servicing expenditure,
- - improvement in sighting equipment.
- limiting logistic costs:
- - improvement of material maintainability,
- - increase in subsystem reliability.

The series of articles will also consider the consequences of realizing these requirements which are, in part, associated with considerable performance and target handicaps.

Preamble

The development systems data used as the basis for all further exposition are presented in Table 1.

As is known, there is no binding division into generations for postwar tanks since each tankbuilding country undertakes development and introduction of combat vehicles in accordance with its own ideas and needs. But a division of the vehicles into four different generations should be made, with each being based primarily on time and technical viewpoints.

1st Postwar Generation:
Vehicle introduction period: 1950-1960
Technical characteristics: component performance and vehicle configuration are comparable with those of battle tanks being used at the end of the war.

2nd Postwar Generation:
Vehicle introduction period: 1960-1970
Technical characteristics: vehicles were serially equipped with IR components for night combat, ABC protective ventilation systems (with exceptions) and primary stabilized main weapons as well as with mechanical computers.

Intermediate Generation:
Vehicle introduction period: 1970-1980
Technical characteristics: primarily combat value-increased versions on the basis of second postwar generation vehicles but with completely new vehicles introduced in some countries. Equipment with relatively highly developed fire control systems and electronic computers as well as primary stabilized optics; use of passive night vision devices (residual light amplifier principle) and partial use of spaced armor including nuclear protection.

3rd Postwar Generation:
Vehicle introduction period: from 1980
Technical characteristics: use of highly developed fire control systems with extensive sensor inventory as well as digital computers (with exceptions); use of passive night vision devices (thermal image devices) and special armor with complex configuration (multiple space/multiple layer armor).

The following part provides a brief description of the progress of overall development.

Review By Type

1st Postwar Generation (1950-1960):

The configuration of the first postwar generation of battle tanks was reached largely under the impression of the last military operations of World War II. This applied in particular to tank development in the United States and Great Britain.

In the United States the tank construction program began in 1946 to replace the M24/M4/M26 vehices progressed very hesitantly so that by the beginning of the Korean War in June 1950 none of the planned new designs (T41/T42/T43) were operationally ready. For this reason the T42 turret, which was regarded as definitely progressive, was hastily mounted on a modified M26/46 chassis. Following further improvements in the chassis and layout, this vehicle went into production at the beginning of 1952 as the M47 battle tank (Figure 1) [not reproduced]. The M47 was, seemingly as a carryover from World War II, one of the last vehicles to have the five-man crew and the typical bow machinegun. Because of the overly hasty introduction and the thus associated technical problems in troop use (this applying to fire control technical equipment in particular), the M47 did not see service by the end of the Korean War (July 1953). In the United States the M47 was regarded as an interim solution with studies being started as early as 1950 for the development of a new medium battle tank with a 90mm L/48 tank gun and optimized turret and hull shape. The first prototypes of this vehicle designated T48 were tested from as early as 1952. These revealed numerous technical problems (including powerplant overheating, unacceptably high fuel consumption, fire control system disturbances). The M48 was not hurt by these and was introduced in 1953. The most significant defects were removed in an improvement program which stretched out to 1958 and resulted in the M48A1 and A2 variants (Figure 2) [not reproduced].

In Great Britain preliminary designs for a so-called "universal tank" dated back to 1943. The first prototypes of the Centurion battle tank were produced in 1945 but could not be put into action during the war as planned. The original requirements called for a combat weight not to exceed 40 tons but the prototypes weighed 46.7 tons and the Mk13 version of 1964 finally reached a combat weight of 51.8 tons. For its time the Centurion (Figure 3) [not reproduced] represented a robust vehicle with sufficient firepower, good protection and moderate mobility. Overall more than about 4,000 vehicles were introduced in the armies of 14 countries.

After the successful design of the T-34 battle tank, in about 1943 the Soviet Union started design work on a new medium tank to replace the T-34/85. The first prototypes of this battle tank designated T-44 (Figure 4) [not reproduced] were completed in 1944 but series production planned for 1946 was never undertaken because of, among other things, serious defects in the powerplant and running gear. As compared with that of the T-34, the T-44 chassis represented such a significant advance (lower height, simpler suspension system, compact powerplant layout, greater shot protection of the hull bow, smaller crew) that it was used for the T-54 battle tank after the weak points were corrected. Apparently a turret with a good ballistic shape was designed for the 100mm tank gun by 1947 so that series production of the T-54 (Figure 5) [not reproduced] could begin from 1948. As compared with comparable tank models, the T-54 was distinguished by superior firepower at short to medium combat ranges [and] adequate armor protection with average mobility. By the beginning of the 1960's about 40,000 T-54/55-series vehicles were reported to have been built and introduced in approximately 40 countries.

The efforts in France in the mid-1940's were aimed at developing a new tank which would have the firepower of the Tiger II and the mobility of the Panther battle tanks. The first prototypes of this vehicle designated AMX 50 and armed with a 90mm tank gun were produced in 1949. Further variants with 100mm and 120mm tank guns followed by 1951 with the weight of the prototypes correspondingly increasing from 50 to 70 tons. Apparently costs proved to be too much for the planners as the decision was made in 1953 to drop the AMX 50 project and purchase the considerably cheaper M47 battle tank. In contrast to the AMX 50, the lighter armored vehicle designs (AMX 13 and EBR 75) originating at the same time were carried to a successful conclusion.

Surveillance Tanks (1950-1955):

Here we should mention for the sake of completeness the so-called surveillance tanks which were introduced in the mid-1950's in the United States (Figure 7) [not reproduced], Great Britain and the Soviet Union. Production of these vehicles was in relatively small numbers and their low cost effectiveness led to their soon being replaced by tank destroyers with long-range guided missiles. It is notable, however, in this context that 25 years later the main battle tanks have reached and even surpassed the categories (such as main weapon caliber, vehicle weight) of the former surveillance tanks.

2nd Postwar Generation (1960-1970):

The second postwar generation of battle tanks appeared in the 1960-1970 period. Because of their IR equipment, they were capable of independent night combat, had, with few exceptions, ABC protective ventilation systems and a primary stabilized main weapon. Due to consolidation of economic conditions, a larger number of countries could now conduct native battle tank development. In the United States and the Soviet Union battle tanks of the first postwar generation underwent an evolutionary further development. Other countries (Germany, France, Sweden and so forth) began with new concepts. In this period the British Vickers 105mm tank gun found worldwide employment in the Western hemisphere (exception: France). What was the state of battle tank development in the individual countries?

Parallel with removing weak points on the M48 tank, from 1954 on the United States began development work on a battle tank of the 30-ton class. Two prototypes of this vehicle designated T95 (Figure 8) [not reproduced] were available in 1957 or 1958. For the time these prototypes had astonishingly modern technology including
- use of a 90mm smoothbore gun; dispensing with tube recoil,
- use of fin-stabilized projectile (core diameter: 37mm, muzzle velocity: 1,524 meters/second),
- OPTAR fire control system with a rangefinder similar to the laser principle.

Following changes in the original development program, the T95 chassis served as a test vehicle for a hydropneumatic suspension system and for a solar gas turbine. The turret was modified to take the Shillelagh system. Although the development of the T95 was dropped because of the then excessively high development risk of some subsystems, the knowledge gained in this development program was later used in subsequent designs (M60A2, MBT70, XM1).

After abandoning the T95 concept, the Americans turned in 1959 to the method normally used in the Soviet Union. This was the evolutionary continued development of models already introduced. The development of the M60 battle tank was completed by 1960 and the M60A1 (Figure 9) [not reproduced] went into production in 1962. Considering that the possibility of reequipping the M48 with a diesel engine (M48A3) was shown in 1960 and the possibility of mounting the 105mm tank gun was proven (M48A5) in 1975, the M60 series no longer displayed a significant combat value increase as compared with the modified M48 models. A total of about 9,700 M60 tanks was produced by Chrysler by the beginning of 1980.

In Great Britain the first studies for a followon model to the Centurion battle tank began as early as 1951. The continuing design work reflected valuable knowledge from the military engagements of the Korean War such as:
- the urgent necessity of having armament superior to that of the enemy,
- the necessity of, by appropriate armor configuration, achieving substantial protection against enemy tank gun and complete protection against artillery splitters.

As early as 1956 the main characteristics of the Chieftain tank already existed in a test vehicle. These included the prone driver position and the mantlet-less gun mount (Figure 10)[not reproduced]. The design was reworked in 1958 with, among other things, the Leyland L60 multifuel engine and the TN12 semiautomatic transmission being introduced. In the 1959-1962 period seven Chieftain battle tank prototypes (Figure 11) [not reproduced] were available for technical tests and troop trials. After the expected defects in the powerplant, transmission, running gear and tracks had been fixed, series production of the Chieftain Mk.3 version (Figure 12) [not reproduced] began in 1967. The weight development is of some interest. At the beginning of the design work, the goal was a vehicle weight of 45 tons but the first prototype weighed already 49.5 tons. The first series vehicle reached 53.8 tons and the last version (Mk.5) weighed 54.8 tons -- thus exceeding the original weight limit by about 22 percent!

The beginnings of the development of the Leopard 1 battle tank can be traced to 1956 (military requirements) or 1957 (technical specifications for a 30-ton battle tank). The actual design work began in 1958. As early as 1960/61 four first-generation prototypes — equipped with a 90mm or 105mm Rheinmetall gun — had been produced. Whereas the vehicles from Company Group "A" (Porsche, Jung, MaK and Luther & Jordan) used components with known technology, the vehicles of Company Group "B" (Warneke/Ruhrstahl, Henschel and Hanomag) introduced new technical solutions such as:

- load-variable eight-gear planetary transmission with hydrostatic steering mechanism,
- hydropneumatic suspension and hydraulic track-connecting fixtures or plate suspension.

The prototypes from Company Group "A" were used as the basis for further development because of the predictable development risk within the given time frame. The 26 second-generation prototypes were fitted with the British 105mm tank gun which had become available in the meantime and initially equipped with a 12.7mm sighting machinegun. They also received for the first time the ten-cylinder mb 838 diesel engine with an output of 610 kW(833 hp).

The performance capability of the sighting machinegun proved to be unsatisfactory and, in the end, the 50 preseries vehicles were again equipped with an optical rangefinder. These vehicles were available from 1963 for tests and troop trials. These vehicles only became night combat-capable through the use of (active) infrared viewing and sighting equipment.

An additional 170 changes and improvements were done prior to the beginning of series production in September 1965. Vehicle weight also threatened to run away in this battle tank development. Whereas the original technical specifications called for a 30-ton vehicle, the first prototypes weighed 36.2 tons, the first series vehicle 39.6 tons and the last version of the Leopard 1 battle tank finally reached 42.4 tons — thus exceeding the initially sought combat weight by 41 percent.

A total of 4,561 Leopard 1 vehicles were produced between 1965 and 1978 and they are in troop service in eight countries. Manufacture of further tanks is planned for coming years. Since 1,550 family vehicles on the Leopard 1 chassis were produced in the same period, the design produced in more than 6,000 units has proven to be a surprisingly attractive one.

A military agreement on joint development of a so-called standard tank existed between France and Germany since June 1957 (joined by Italy in September 1958). The first French prototype (weight: 32.5 tons) originated in 1960 (Figure 14) [not reproduced]. A preseries of the vehicle now designated AMX 30 was manufactured in 1963 and delivery of AMX 30 battle tank series vehicles (combat weight: 36 tons) (Figure 15) [not reproduced] began in the fall of 1966, a year after the start of Leopard 1 series production. About 1,800 vehicles of this type were built by 1980. The French Army has over 1,200 of these with the remainder having been exported to, among others, Greece, Iraq, Lebanon, Peru, Saudi Arabia, Venezuela and Spain (licensed production here).

As early as 1957 in Sweden, the beginning of the development of the "S" battle tank marked the start of feasibility studies of using the chassis of a tracked vehicle to train a rigidly mounted gun. After the positive conclusion of these preliminary tests, design work began on the first two prototypes of the "S" battle tank. These vehicles underwent a comprehensive test from 1961 and ten other preseries vehicles were available from 1963. Series production of this unconventional battle tank began in 1967 and a total of 300 were produced for the Swedish Army by 1971. Components of the "S" tank were also used for the Swedish VK155 tank gun but development of an antiaircraft tank with "S" tank chassis components was dropped at the end of the 1960's.

After Swiss efforts in the late 1940's to purchase battle tanks abroad resulted in considerable difficulties, the first concepts for development of a domestic battle tank (KW30) matured as early as 1951. Work proceeded very slowly in the following period and it was almost seven years before the prototypes of the vehicle now designated Pz58 were ready. In 1957 it was decided to increase production to ten preseries vehicles, these models still being equipped with a Swiss-made 90mm tank gun. After testing of these vehicles, a decision in favor of the British 105mm tank gun was made in 1961. The first Pz61 (Figure 17) [not reproduced] series vehicles equipped with this weapon were rolled out in 1964. The compact construction (the vehicle width of 3.06 meters makes the Pz61 one of the smallest tanks) resulted in a rather favorable combat weight of 38 tons. Although this was the first Swiss native battle tank development, these vehicles are reported to have done well in troop service.

In addition to the United States, the Soviet Union began as early as the beginning of the 1960's to introduce a second postwar generation battle tank. The T-62 (Figure 18) [not reproduced] was first spotted in 1961 before it was officially presented at the traditional May Day parade in Moscow in 1965. As compared with the T-54/55, the turret with the 115mm smoothbore gun represented the most important combat value increase. This was evidently a response to the 105mm tank gun previously introduced in the West. It is possible that there was also a new chassis (such as for the T-64) under development for this turret but which could not be developed to series production stage by the beginning of the 1960's because of technical problems and resulted instead in a T-54/55 chassis being modified and introduced for this turret.

Based on information now available, the T-62 — despites its high-performance 115mm smoothbore gun — displays only insignificant improvements as compared with its predecessor model. But it was put into troop service at the beginning of the 1960's despite the following faults:

- unequal turret and hull frontal protection,
- main weapon use by commander not possible,
- difficult handling of the 115mm ammunition under the hazardous space conditions,
- the vehicle not really suited to fight on the move despite available weapon stablization because only two rounds are firmly secured in the turret,
- unequal performance level between main weapon and fire control equipment,
- the combat compartment could not be securely sealed even during ABC weapons use because of a non-overridable case ejection system,
- multiplate dry clutch subject to wear; transmission not shiftable under load, high stress on powerplant and running gear elements because of weight increase from 35.4 (T-54) to 38.6 tons,
- high noise and vibration stress on the crew.

Instead of removing the T-62 defects noted, the Soviets evidently decided to opt for the development of a followon model (M-1970, T-64).

Intermediate Generation (1970-1980):

Because of dynamically progressing development, particularly in the area of optronic components, in the 1970's a number of countries decided to build combat value-increased versions of the second postwar generation. The improvements or performance increases applied primarily to fire control equipment (use of laser rangefinders, passive night vision devices using the residual light amplification principle and, in part, use of primary stabilized optics and spaced armor). New battle tanks using available technology and not based on second postwar generation vehicles appeared in Israel and Japan in the 1970's. The T-64/72 types should also be considered as intermediate generation since they lack significant characteristics of the third postwar generation. What did the development of these vehicles in individual terms look like?

In the United States the Shillelagh missile system was developed at the beginning of the 1960's for the Sheridan scout tank. The use of this weapon for the M60 as well was investigated from 1964. By the end of 1965 the first prototype of the vehicle then designated M60A1E2 was ready. But considerable problems (stabilization system, fire control, consumable propellant charge) appeared in the subsequent tests. A contract for 300 turrets was issued in 1966 without waiting for the defects to be solved. Because solving the problems (particularly that of the consumable propellant charge) took longer than expected, turret production was stopped until 1972. Equipping the troops with the M60A2 (Figure 19) [not reproduced] finally began in 1974 — ten years after manufacture of the prototype! The vehicle was used for surveillance missions in U.S. Army Europe tank battalions. Overall only 526 units of this type were produced.

As a conclusion to manufacture of the Leopard 1 battle tank for the German Bundeswehr [federal armed forces], 250 A4 versions (Figure 20) [not reproduced] (6th lot) were produced between 1974 and 1976. As compared with the previous vehicles, it used for the first time an integrated fire control system (with a computer-controlled rangefinder for the gunner, a primary stabilized panoramic periscope with IR night channel for the commander and a hybrid computer) and had an automatic transmission. The spaced-armor revolving turret came from the A3.

In Switzerland work began early in 1966 on measures to increase the combat value of the Pz61. Significant innovations planned were an electrohydraulic weapons stabilization, a new track with rubber pads, increasing engine output to 485kW (660 hp) and replacing the coaxial 20mm machine cannon with a 7.5mm machinegun. These measures resulted in the combat weight increasing from 37.0 to 38.5 tons. Technical tests of the Pz68 were apparently not done with the required intensity as a number of defects (ABC protective ventilation system, transmission, weapon stabilization, electromagnetic compatibility problems, fuel tank life, running gear stability) appeared after the first series vehicles were delivered to the troops. The increase in turret size in the third Pz68 series and the associated further weight increase to 40.5 tons significantly increased transmission and running gear problems. It is noticeable that a great many of these defects are attributable to the attempt to keep a 1950's tank design competitive with more modern models. This applies in particular to the Leopard A3, which Switzerland considered purchasing in 1974.

The first studies to further develop the AMX 30 began in France in 1972. The result was the AMX 30B2 version first displayed at Satory in 1979. The reequipping of the base model was to start in 1981. The AMX 30B2 was to have a new transmission with a torque converter (in place of the earlier centrifugal force clutch) and hydrostatic steering as well as the COTAC fire control system with laser rangefinder and passive night vision devices (LLL-TV) with monitors for the commander and gunner. Since the 105mm DEFA gun of the AMX 30 initially had only a shaped charge round, 13 years after its introduction a high-performance fin-stabilized projectile (muzzle velocity = 1,525 meters/second) was developed. The AMX 30B2 is also in the future to be equipped with supplementary turret armor like the Leopard A1A1.

The AMX 32 (Figure 21) [not reproduced], development of which started in 1975, is intended for export. This vehicle has all AMX 30B2 improvements but also has a rolled steel hull and turret for better ballistic protection and protective running gear skirts. Interestingly, the AMX 32 does away with the commander's cupola used on the AMX 30 and uses instead a primary stabilized panoramic periscope and a fixed prism scanner. The turret can take either the 105mm DEFA rifled gun or the EFAB 120mm smoothbore gun.

After the relatively late introduction of the Type 61 battle tank (Figure 6) [not reproduced] in 1960, from 1964 Japan began complete development of a followon model. Six Type STB prototypes underwent technical tests between 1969 and 1973. Series production began in 1975. With a yearly overall rate of only 48 vehicles, the requirements (about 500 units) of the Japanese armed forces will be covered only by 1981. The Japanese Type 74 (Figure 22) [not reproduced] shows a conventional design in its overall configuration, with unusual paths being followed only in certain components (such as the air-cooled two-cycle diesel engine and the hydropneumatic suspension). The use of actually available technology such as an analog computer and laser rangefinder is noted in its remaining equipment.

In Israel studies for a native battle tank development began in 1970 with the first prototype being available in 1972 and official turnover of the Merkava battle tank to the troops in 1978. The design was based on combat experience gained in the two Mideast wars of 1966 and 1973. Tank crew survivability was given a high value. Analogues to English tank development are recognizable. The Merkava (Figure 23) [not reproduced] is the only tank with a rear door, this making it possible for the crew to evacuate under protection when hit and also shortening ammunition replenishment time. Features such as primary stabilized main weapon, laser rangefinder, digital computer and spaced armor show vehicle transition from the intermediate to the third postwar generation.

As already noted, the Soviets maintained their rhythm of introducing a new battle tank every 7 to 10 years. Consequently a new battle tank type (T-64) was first observed in the interior of the Soviet Union at the beginning of the 1970's and then the T-72 (Figure 25) [not reproduced] was observed in the mid-1970's. These vehicles showed a deliberate approach to removing T-62 weaknesses as indicated by the following characteristics:

- around 22-25 rounds available at the main weapon because of an automatic loader,
- use of primary stabilized sights and optical rangefinder (evidently replaced by laser rangefinder in later versions),
- higher hit probability as compared with T-62, likely achieved through a new weapon (with protective heating cover) and new ammunition,
- case ejection mechanism no longer needed because of the change to separate-loading ammunition with consumable propellant charge; thus also giving complete ABC protection (applies to T-64),
- use of a new powerplant and dispensing with the hitherto customary multiplate dry clutch,
- equipped with a dozer blade,
- improvement of driver viewing conditions.

The reason why the Soviet Union introduced two very similar vehicles consecutively in a relatively short period cannot be explained at present. It is conceivable that the T-64 was to be used for widescale tests of new component technologies (powerplant/running gear/automatic loader/fire control system) — possibly with a view to a future battle tank (T-80). Following the evaluation of this "troop trial on a grand scale," the basic design was retained while unsatisfactory components were replaced with sturdier ones (older technologies) and production of the modified vehicle (T-72) began in the USSR, Czechoslovakia and Poland. This vehicle has been used to equip the armies of the East bloc states (USSR, Bulgaria, GDR, Poland, Czechoslovakia, Hungary and Romania) as well as being delivered to friendly nations (Algeria, Libya, Syria and India).

Although the MBT70 was never developed to the series production stage, the most important characteristics of this program should nevertheless be mentioned here. In order to replace the first postwar generation battle tanks being used in the American and German armies, both countries agreed in August 1963 to develop a common battle tank. After the study phase, a design was selected which clearly reflected a number of components which would, in part, be developed to the series production stage only in third generation postwar vehicles. These included:

- primary stabilized sights for commander and gunner; laser rangefinder; digital computer,

- three-man crew (including driver) in the turret,
- special armor and nuclear protection for the combat compartment,
- passive night vision devices (LLL-TV) and also
- combination weapon and ammunition with consumable propellant charge,
- hydropneumatic suspension with adjustable level,
- air conditioning for the combat compartment,
- high-performance powerplant resulting in a specific power output of over 22kW/ton (30 hp/ton),
- automatic loader for the main weapon.

The first prototypes were completed in 1967. Overall the tests indicated that
- even after a development cost of around DM 830 million, development of the vehicle to the introduction stage was not likely,
- the cost effectiveness of this design was questionable because of the anticipated cost in the use phase (especially for material support),
- the complexity of the overall system would be excessive for an army consisting of conscripts.

At the end of 1969 MBT70 development was stopped by the German side. The U.S. Army attempted to develop a simplified version (XM803) to the introduction stage but this was also dropped in December 1971.

3rd Postwar Generation (1980-1990):

Since 1980 a number of third postwar generation battle tanks have been introduced. Other models are in the development stage. These vehicles are characterized by the use of special armor and complex fire control systems with passive night vision devices (primarily thermal imaging) and diverse sensors to measure relevant environmental parameters. From the technical standpoint, these vehicles thus possess the prerequisites for continuous combat by day and night and poor vision. In the meantime the development and procurement costs for these vehicles have increased to the extent that some of the tank-building countries (Switzerland, for example) have forgone native development in this phase. Development in individual cases [follows]:

Shortly after the beginning of Leopard 1 series production in September 1965, the first ideas for a combat value increase of this battle tank were proposed. In 1969 two experimental models were built and tested for this experimental development. Following the termination of MBT70 development at the end of 1969, the knowledge and experience from both projects flowed into the then continued national development of the Leopard 2 battle tank. In the period from 1972 to 1974 16 prototypes of the so-called first generation were manufactured with differing weapons designs, night vision devices, suspension systems and the like (Figure 26) [not reproduced]. So as to achieve greater ballistic protection within MLC50, as early as 1973 a new turret with a correlation rangefinder (base: 350mm) was proposed in place of the previous optical rangefinder (base: 1,720mm). The Yom Kippur War at this time emphasized the significance of armor protection with the result that the Leopard 2 upper weight limit according to MLC50 (about 47.5 tons) was increased to MLC60 (around 55 tons). The T14 mod. turret with a considerably improved ballistic protection resulted within the framework of these new conditions. The vehicle design was again fundamentally reworked on the basis of a December 1974 agreement with the United States on battle tank standardization. Within 18 months there resulted two prototypes of the so-called AV [Austere Version] which underwent a comparative evaluation with the XM1 (Figure 27) [not reproduced] in the United States in the fall of 1976. In contrast to the 16 first generation prototypes, the second generation AV prototypes had the following characteristics:

- improved ballistic protection by using MLC60,
- primary stabilized sights with slaved main weapon,
- omitting the auxiliary engine,
- omitting the IR night vision equipment; dispensing with an autonomous night sight device for the commander,
- rearrangement of ammunition, fuel and hydraulic energy provisions as well as modification of the hull floor to increase overall system survivability.

The experience gained in the period from 1976 to 1978 in tests and troop trials with the AV prototypes were used in the final design for series configuration (Figure 28) [not reproduced]. Following the manufacture of four so-called advanced series vehicles, the first series vehicle was officially handed over to the German Army on 25 October 1979 — thus allowing an important milestone in the Leopard 2 program to be reached after a 13-year development period. The Leopard 2 design in coming years will be marked by an intensive further development.

After the failure of the XM803 program, work began on a future battle tank in the United States in February 1972. The corresponding development contracts were given in 1973 to the firms of Chrysler and General Motors. The prototypes from both firms were ready at the beginning of 1976. In November 1976 the decision was made for series production of the Chrysler version.

During 1978 11 M1 (Figure 29) [not reproduced] preseries vehicles were manufactured and subsequently subjected to targeted testing for weak points. The gas turbine and its accessories and the running gear proved in particular to require rework. The production of an initial 110 series vehicles was finally approved in May 1979 and the first series vehicle was transferred to the U.S. Army in February 1980. The decision about complete series production was to be made in June 1981. This calls for the production of a total of 7,058 vehicles.

If the Soviet Union maintains its seven- to ten-year rhythm for introducing a new battle tank model, introduction of the T-80 can be expected by 1983 at the latest. Since the T-72 represented a remarkable qualitative advance and the material support requirements for this type should have resulted in not inconsiderable problems, it can be assumed that the T-80 will in turn represent an evolutionary further development of the predecessor model. In comparison with Western third postwar generation vehicles, there is primarily a catchup requirement in the use of new protective technologies. It is thus no surprise that a battle tank type with a welded turret (and spaced or multilayer armor?) and running gear skirts is said to have been undergoing troop trials for some time (Figure 31) [not reproduced].

In Great Britain further development of the Chieftain battle tank began in 1970 under the project designation FV4211. This retains major components of the Chieftain while using a new hull and turret structure with Chobham special armor. Further work on this vehicle was stopped in 1972 with the beginning of the British-German Battle Tank 3 development.

Development of the FV4030 series began in 1974, the impetus coming from Iranian interest in a combat value-increased variant of the Chieftain. The FV4030/1 had an automatic transmission, increased fuel reserves and a slightly improved running gear. Only with the FV4030/2 (Shir 1) could the RR Condor 12V1200 with 895kW be used in connection with the TN37 transmission. The first prototypes were completed in 1977 but no deliveries were made to Iran (but 278 of these vehicles were sold to Jordan at the end of 1979). The FV4030/3 (Shir 2) (Figure 30)[not reproduced] was offered as a further development which, in addition to the improvements already mentioned, also had Chobham armor. The combat weight of this version reached 62 tons (MLC69!).

The FV4030/3 project served as the basis for the future Challenger battle tank (FV4030/4), which is to replace the Chieftain in the British Army of the Rhine formations from 1984. Special characteristics of the Challenger will be hydropneumatic suspension from the Laser Engineering Company. This will result primarily in mobility and armor protection improvements as compared with the predecessor model.

Development work on the STC battle tank has been underway in Japan since 1976 and the first prototypes of this third postwar generation battle tank are to be ready in 1983. Series production stages is not expected before 1988. The vehicle is, among other things, to be equipped with a Japanese 120mm smoothbore gun and multilayer special armor (with ceramic constituents). Also a new eight-cylinder diesel engine (716kW/970 hp) is being developed for the 45-50 ton vehicle. (to be continued).
[This is the first part of a projected eight-part series. Subsequent articles will be published as received]

Table 1. Battle Tank Development 1950–1980 or 1990

1st Postwar Generation:		
	United States:	M47/M48
1950–1960	Great Britain:	Centurion
	Soviet Union:	T-54/T-55
	Japan:	Type 61
Surveillance Tanks:	United States:	M103
1950–1955	Great Britain:	Conqueror
	Soviet Union:	T-10
2nd Postwar Generation:		
	United States:	M60/M60A1
1960–1970	Great Britain:	Chieftain
	Soviet Union:	T-62
	France:	AMX 30
	Germany:	Leopard 1
	Switzerland:	Panzer 61
	Sweden:	Strv 103 "S"
Intermediate Generation:		
	United States:	M60A2;A3
1970–1980	Great Britain:	P4030/1 and 2
	Soviet Union:	T-64/T-72
	France:	AMX 30B2/AMX 32
	Germany:	Leopard 1A4
	Switzerland:	Panzer 68
	Japan:	Type 74
	Israel:	Merkava
3rd Postwar Generation:		
	United States:	M1
1980–1990	Great Britain:	P4030/3 Challenger
	Soviet Union:	T-80
	France:	Char 90
	Germany:	Leopard 2
	Sweden:	
	Japan:	STC

PHOTO CAPTIONS

1. p 70. M47 battle tank in service with the German Bundeswehr. Note the small turret silhouette during approach.

2. p 71. M48A2 battle tank of the German Bundeswehr. As compared with the M47, the turret was substantially increased. Tracks were also widened.

3. p 71. Israeli Army Centurion battle tank with 105mm tank gun, Continental V12 diesel engine and other improvements. The running gear skirts improved protection against shaped charge shells and, particularly in desert operations, decreased air filter stress.

4. p 70. T-44 battle tank — first postwar design of the Soviet Union and immediate forerunner of the T-54. Whereas the chassis is a completely new design, the turret is still basically that of the T-34/85.

5. p 71. T-54 battle tank undergoing field maintenance. Notable is the simple turret construction (without turret basket). Because of the narrow mantlet, forward weapon extension is not possible.

6. p 71. Japanese Type 61 battle tank. The turret resembles that of the American M47. The vehicle has forward drive even though the engine is mounted in the hull rear.

7. p 70. U.S. Army M103 of 1954. Weight: 54.5 tons, main weapon: 120mm. The main battle tanks of the 1980's have again reached the category of the former surveillance tanks!

8. p 71. Prototype of the T95 which was conceived as a followon to the M48. The Soviet philosophy of the wheel running gear was used in the running gear.

9. p 71. U.S. Army M60A1 battle tank. Originated as an evolutionary further development of the M48 series. Little attention was given to a favorable silhouette in this design.

10. p 72. FV4204 — a Chieftain program experimental vehicle to test the prone driver position and the mantlet-less turret.

11. p 73. Chieftain battle tank prototype of 1961 with low running gear and divided commander's hatch. The flat driver front is notable.

12. p 73. Chieftain battle tank series configuration. The large main weapon (and turret rear) overhang can be extremely disadvantageous when operating in covered, forested and builtup terrain.

13. p 72. Leopard A1 battle tank with cast turret and supplementary turret armor. This picture clearly demonstrates the necessity of a periscope cleaning system, particularly for the driver.

14. p 73. AMX 30 battle tank prototype of 1960. Note the flat running gear and the flat configuration of the commander's cupola.

15. p 73. AMX 30 series configuration. The flat configuration of the chassis and turret is negatively influenced by the 570mm-high commander's cupola. The picture clearly shows the stretched configuration of the cast turret.

16. p 72. The Swedish "S" battle tank with the 105mm tank gun in a fixed hull mount. The dozer blade and larger than usual periscope are clearly seen in the picture.

17. p 73. Swiss Pz61 with 105mm tank gun and tube-parallel 20mm machine cannon. Turret and chassis are manufactured completely from cast armor steel.

18. p 73. T-62 battle tank. The picture shows the ballistically favorable shape of the turret. The turret rises relatively high above the running gear. The upper portion of the commander's cupola with periscope and four prisms is notable.

19. p 74. M60A2 with 152mm combination weapon. With an overall height of 3.31 meters, the M60A2 is one of the tallest battle tanks! It can be seen in the picture that the commander's cupola alone represents a very expensive solution.

20. p 74. Leopard A4 battle tank — the most modern version of the Leopard A1. The picture clearly shows the size of the welded turret.

21. p 75. French AMX 32 battle tank prototype with 105mm rifled gun and coaxial machine gun. Notable is the accumulation of externally attached components and accessory parts (dangerous when hit!). The simple design of the AMX 30PT in Figure 14 presents an interesting comparison.

22. p 74. Japanese Type 74 battle tank. The external shape shows certain similarities with Soviet types. The commander does not have rotable optics for battlefield reconnaissance. Repelling bars in front of the turret.

23. p 74. Prototype of the Israeli Merkava battle tank with powerplant in the hull bow and unique turret design.

24. p 75. German prototype of the MBT70. Recognizable are the very large turret for the three-man crew and the retracted 20mm machine cannon. In front of the commander's hatch [are] the night vision device (LLL-TV) and the panoramic periscope for using the 20mm cannon.

25. p 74. T-72 battle tank on Red Square during the 1977 November parade. The small dimensions of the vehicle are notable. On the turret top are numerous viewers of the rather advanced fire control system.

26. p 74. Leopard 2 battle tank prototype (1st generation) with 120mm smoothbore gun and split-mount 20mm machine cannon on the turret top. The picture clearly shows the limits of effort necessary for a universal tank.

27. p 75. Leopard 2 battle tank (Austere Version) (2nd generation). Frontal and flank ballistic protection was considerably increased by special armor. The vehicle pictured has — like the Merkava — three machineguns!

28. p 77. Leopard 2 battle tank series configuration. As compared with the AV, hull front, driver hatch and track skirts, among other things, were changed. The commander's periscope was simplified.

29. p 77. American M1 battle tank preseries vehicle. Like all Western third postwar generation battle tanks with special armor, the M1 also shows large-surface external contours without rounding. The main sight viewer was installed in the roof of the turret so as to improve turret frontal protection.

30. p 77. FV4030/3 — a forerunner of the British Challenger future tank. With a combat weight of 62 tons (MLC69), the size of the former Conqueror battle tank has again been reached!

31. p 77. According to a Western trade journal, the battle tank shown here with a welded turret (designation T-74 or T-80?) has been undergoing troop trials in some units in the interior of the Soviet Union since 1980. As compared with the T-64/T-72 battle tanks, improvements in ballistic protection and fire control equipment may be expected.

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IMPROVEMENT OF TRAINING FACILITIES DISCUSSED

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 17

[Article by B. Kulikov, chief inspector, USSR Committee for People's Control: "Zealousness in Everything"]

[Text] An untiring struggle for economy and thrift is doubtlessly the main road for successfully reaching the goals posed by the party for the 11th Five-Year Plan. As Comrade L. I. Brezhnev noted in the Accountability Report to the 26th CPSU Congress, "...something which would seem simple and very mundane is becoming the core of economic policy--a thrifty attitude toward the public wealth, and an ability to use everything we have fully and suitably."

It is precisely from these positions that we inspected the condition of the training material base at Moldavian production facilities and civil defense headquarters and determine whether or not it was being used sensibly. The inspection persuaded us that the campaign for zealous administration has not yet been joined by everyone in a number of places. As an example the development of the civil defense training material base is often planned without considering the real needs and possibilities of the rayons and national economic facilities. Locally, these plans often do not contain concrete measures associated with building the material base, and do not foresee the appropriate outlays for these purposes. Therefore, control over them is poor, and they are sometimes not completed. And in determining the targets for 1980, the long-range goals for construction of training grounds, training centers and classrooms were generally reduced by 10-15 times.

Here is a striking example. In July 1980 the executive committee of the Bel'skiy City Soviet of People's Deputies adopted a special decision, "On Creation and Improvement of the Civil Defense Training Material Base," which foresaw construction of a city civil defense training ground, construction of nine of the same by forces of the local enterprises and organizations and creation of individual civil defense training facilities at a number of plants, institutions and schools. But this decision has never left the drawing boards.

Some of the plans are purely declarative in nature. Thus there is no concreteness in the plans for improving the training base drawn up by the civil defense staffs of Bendery and the republic's civil defense school. Some local facilities lack not only long-range plans for creating and improving the training material base but even plans for the current year.

The Statute on the Civil Defense Training Material Base states that training grounds must be the foundation of this base and that their necessary quantity, their locations and the order of their construction in the republic and in the cities and rayons are to be determined by the civil defense chiefs. But a spot check of the national economic facilities established that contrary to the requirements, some enterprises are building only portions of the training grounds that are ill-suited for the training of civil defense formations or for conducting exercises and for providing practical training to laborers and white collar workers. The civil defense training grounds are sometimes located in remote areas, as a consequence of which their use is poor; some of them are left unattended, they get overgrown by weeds, and they become dilapidated. This is not to mention that they look neglected and abandoned. In a number of cases, even that which is erected is not coordinated with the architectural planning organs. As a result completed training places are sometimes razed to make way for urban buildup and population centers. This means that the efforts, materials and resources allocated to development of the training material base are wasted.

The fact that a number of city and rayon schools are still located in basement rooms ill-suited for training also does a certain amount of harm to the quality of the civil defense training received by the public. Concurrently, poor use is made of the practical training base available at national economic facilities assigned to these schools.

We should also make note of the fact that some schools possess a significant quantity of unneeded, surplus property which is never disposed of, despite the annual inventories. Three schools in Kishinev possess 120 units of more than 30 different items in excess of the property standards. These "depositories" include highly scarce radio sets, radio communication centers, switchboards, motion picture projectors, telephone sets and so on.

The republic civil defense school acquired a USKhA-2 automatic student testing unit back in 1977, but it has yet to use it.

Unsensible use of mobile civil defense classrooms has gone unpunished for a long period of time. They are often used as ordinary transportation resources, or as soon as such a "Kubanets" is received, it is raised up on wheel blocks and all of its equipment (the movie projection equipment, tape recorder, radio broadcasting unit and so on) is placed in storage. Is this really a sensible way to use this equipment?

Another impression that is created is that training material, technical training resources and visual aids are furnished essentially haphazardly, depending on the efficiency and initiative of the facility chiefs of staff. As a result a significant quantity of civil defense training and visual aids accumulate at some enterprises while others feel a need for such property. I think that rayon and city civil defense staffs must approach the distribution of this property more responsibly.

Certain shortcomings were revealed in the organization of training at the civil defense schools. Some city and rayon civil defense schools are unable to prepare teachers for second and fifth grades from one year to the next. Nor are things going well with the training provided to formation commanders. Moreover the quality of the training received by those who "got stuck" with training is nothing to be envious about, inasmuch as they are formed into groups of 45 persons and more.

Deviations have been made from the work plans of the republic's civil defense school. Neither the training material base assigned to national economic facilities nor the positive work experience of enterprise civil defense chiefs have been studied by the instructor staff. Nor has the staff been able to find the resources to provide methodological assistance to some organizations and rayons.

All of this attests to insufficient attention to these issues on the part of the appropriate civil defense chiefs, and to poor control by their staffs. As was emphasized at the 26th CPSU Congress, deviations from the plans and plan corrections aimed at reducing the targets are causing disorganization, demoralizing the personnel and encouraging them to be irresponsible.

In order that such facts would not be repeated henceforth, I believe we should dispense with "eyeball" planning forever, we must constantly compare what we want with what we really need, and we must relate responsibly, and not carelessly, to our assigned work. In this connection the departmental control offices and the groups and posts of people's control--all whom society has asked to be its watchmen, should decisively fight mismanagement and cases of careless and sometimes outright negligent squandering of materials and resources.

A zealous, thrifty attitude toward the public wealth and the ability to use everything we have fully and suitably will make us more successful in completing the tasks posed by the 26th CPSU Congress and the main task of civil defense--protecting the public and the country's economy from mass destruction weapons.

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KANDALAKSHA CIVIL DEFENSE FUNCTIONS CONTINUE

Civil Defense Activities in Kandalaksha Cited

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 18

[Article by special correspondent P. Gorbunov: "In an Arctic City"]

> [Text] Kandalaksha is a city of glorious revolutionary combat and labor traditions. It is growing larger and more beautiful with every year. Implementing the decisions of the 26th CPSU Congress, in addition to working on their production targets the labor collectives of the industrial enterprises are also successfully completing their defense tasks. It is no accident that Kandalaksha workers won the perpetual banner of the Murmanskaya Oblast CPSU Committee and the oblast executive committee for their successes in improving civil defense.

Those who had lived and worked here in the menacing years of the Great Patriotic War remember well the havoc caused by bombs dropped by fascist vultures upon the railroad terminal, the mechanical plant and the port--the gateway to the White Sea. The Soviet people labored with all their strength, manufacturing war products for the front. At the same time they were also warriors and commanders of local air defense formations, they rescued casualties, and they restored damaged buildings, utility networks and railroad tracks.

On 23 July 1941, following a massed enemy air raid, the barracks in which workers of the mechanical plant lived suffered considerably. An emergency restoration team headed by chief mechanic A. Trok entered the destruction zone. The warriors labored all day here under his guidance, fighting the aftermath of the raid, and when night came, having had no opportunity to rest, they began their own shift behind the machine tools.

"There was nothing else we could do," said I. Ruzhnikov, who was the plant's acting air defense chief of staff at that time. "We had to make rush repairs on tanks and motor vehicles coming straight from the forward edge of defense, where Soviet soldiers halted the enemy in the Kandalaksha sector. Moreover the equipment that was left behind after the plant was evacuated was used to produce mortars, automatic rifles and grenades."

Once in 1942 a powerful explosion shook the ground, destroyed the fence, broke the windows in the shops of the mechanical plant and laid waste the blackout equipment. But the production equipment did not suffer. The plant continued to work. And when an enemy bomb got stuck unexploded in the plant's water pipeline, there was more trouble to contend with. We turned to the combat engineers for help. They disarmed the bomb and removed the detonator. But as for extracting this monster from the destroyed portion of the pipeline, this we had to tackle ourselves. Water gushed forth from the broken pipe. The city and the plant were left without water. It had to be carried from the Niva River by two tank trucks until the warriors of A. Basharov's emergency restoration team managed to drag the bomb out of the deep crater with a hand-operated tackle and blew it up at the base of one of the distant hills.

Anna Nikolayevna Freydina, a former medical worker of the railroad station, Yevdokiya Fedorovna Tatarina, an observer from an observation tower and others had many interesting things to tell as well. Although they are all retired now, they are continuing their work, transmitting their knowledge and experience to today's warriors of the nonmilitary civil defense formations.

For example Comrade Tatarina told the story of how she survived an especially brutal enemy air raid. One of the bombs fell into the dining hall. The explosion stunned several people, including Yevdokiya Fedorovna.

"I came to in the hospital," she said. "I could not understand what I was doing there. It did not seem to me that I was wounded, and my arms and legs were whole. I asked the doctor: 'What's the matter with me?' 'You've got a contusion,' he said. 'You'll have to stay here a week for treatment.' And as he promised, I was released in a week. I went to the local air defense headquarters. I was sent to the observation tower. I observed enemy airplanes, and I spotted fires and bomb strikes."

And so it was during the trying years of war. But what is the existence of Kandalaksha's civil defense like today, in peacetime, and how is it improving? The city itself has changed unrecognizably in the postwar five-year plans, and its population has grown much younger: More than a third of the residents belong to the generation which did not know the war. But these grateful children treasure the memory of those who defended the city and of the glorious deeds committed by Soviet soldiers and local air defense warriors. Evidence of this can be found in the numerous monuments and obelisks erected in the city itself and along the Kandalaksha-Alakurtti road.

A motor vehicle repair plant--a fast-developing facility with a good future--was built after the war next to the mechanical plant, which at that time was the principal enterprise here. A composite civil defense group intended to perform missions in the interests of the city as well was created at this new plant.

In December 1980, owing to the bitter cold, the heating system and the water lines servicing many homes of microdistrict Niva-3 broke down. On orders of the city civil defense chiefs, the motor vehicle repairmen sent the first squad of the composite group to the trouble site, reinforced by sanitary engineers from the technical emergency squad. These people were assigned three multistory houses on Kirovskaya Avenue with the mission of replacing the damaged pipes. The workers were led by foreman V. Rybakov. For more than a day the warriors labored without sleep and rest in very difficult conditions. Together with other formations of the city, they restored the damage in the utility networks and gave the residents of the microdistrict heat and water. Sanitary engineers A. Lebedev and Ye. Tikhonov and squad warriors A. Glazychev, S. Yefimov and others distinguished themselves especially.

"All of our warriors and commanders are well prepared for such action," said the group commander, N. Shubarin. "Our practical training is strictly according to plan in all special tactical lessons and exercises, in which a complex situation is created every time. Thus during an integrated facility exercise we simulated the collapse of a major wall. In one of the shops the wall had to be dismantled, and a hole had to be punched through. Extras simulating casualties were located in the ruins and in the upper stories of the buildings. The rescue workers had to exert themselves to the maximum, and they had to actually perform all the actions associated with rescuing people."

The situation in this exercise, during which the rescue workers cooperated with medical workers of I. Pospelova's squad to remove people from the ruins and provide first aid to casualties, promoted development of soldierly qualities, steadfastness and selflessness. The commander and the deputy commander for political affairs speak of the commanders of their squads, and of the warriors themselves with great respect and warmth, mentioning, among others, P. Yushkevichus, V. Mishunichev, A. Ben'kovskiy, M. Nebol'sin and R. Luboshnikova.

So go the civil defense training days not only at the motor vehicle repair plant but also at other national economic facilities. At the threshold of the USSR's 60th anniversary and the 50th anniversary of our country's civil defense, a socialist competition aimed at raising the effectiveness and quality of training is getting started everywhere.

I would like to end my story about this arctic city with one wish. The city has a local history museum affiliated with the one in Murmansk. But unfortunately its exhibits say nothing at all about the actions of Kandalaksha's local air defense forces, or about the acts of heroism committed by the formation warriors and commanders. Of course, this is not right. Material could be successfully gathered by third and ninth grade search groups at schools creating their own museums. The city's civil defense staff should obviously make a concentrated effort in this.

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Civil Defense in Kandalaksha Region Discussed

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 19

[Article by S. Yefimov, civil defense chief, Kandalaksha Marine Commercial Port, Murmanskaya Oblast: "The Key to the Success"]

[Text] On 4 October 1982 USSR civil defense will celebrate its 50th anniversary. It has now been many years that we have summarized the results of each training year and conducted civil defense days precisely on this day as a rule. Last year this day became the starting point for Civil Defense Week, during which many useful things were done (lectures, discussions, movie showings, quizzes and competitions).

Preparations have already started for the forthcoming holiday. In particular we are planning to hold meetings with local air defense veterans and to study materials connected with the history of civil defense. But the main thing is to improve civil defense and to make training productive.

In its socialist competition with collectives of other facilities in the city of Kandalaksha, our labor collective is striving for a winning place. We already possess four challenge banners. Two of them were won for production indicators in competitions with transport enterprises and the Murmansk Marine Commercial Port. The third banner was awarded to us by the city CPSU committee and the executive committee of the city soviet of people's deputies for the improvements we made in civil defense. And the port's DOSAAF members have kept the challenge banner of the city DOSAAF committee for several years in a row already for good results in public defense work. All of our production concerns are coordinated closely with defense work. This apparently is the key to success.

During the last training year we completed the 20-hour program with practical lessons in which study groups exercised themselves in the standards. About 70 percent of the laborers and white collar workers received good and excellent grades in the final lessons. More than half of our collective's members passed the "Civil Defense" standards of the GTO ["Ready for Labor and Defense of the USSR"] complex. It would be important to note that make-up practical lessons were given for all who were unable to complete the training program for various reasons, so that all individuals could get the training and pass the standards.

We have more than 20 training group leaders. They all underwent training in the city civil defense school, and they constantly receive methodological assistance from the staff. The best lesson leaders are V. Vasil'yev and V. Yegorov. They lead docker training groups, and they competently teach the fundamentals of protection against mass destruction weapons, laying emphasis on practical training for the students. The dockers regularly exercise themselves in the standards, and it is no accident that they enjoy the best results in the competitions.

We organize testing in the standards, including those of the GTO complex, in the form of competitions. We create a committee of judges including representatives from the civil defense staff, the sports committee, the Komsomol committee and DOSAAF. The study groups undergo training beforehand, and they prepare themselves thoroughly for a serious examination. Then they undergo testing in the standards, the winners are determined, and grades are given to each student.

We orient ourselves in the training afforded to nonmilitary formations to teaching the warriors and commanders how to act in complex conditions. In this case we try to develop high moral-political and psychological steadfastness, endurance, resourcefulness and other qualities in the students that are so necessary in scouts, rescue workers and warriors of other formations. To make the conditions of the special tactical exercises and lessons as real as possible, we make broad use of simulation resources, we conduct useful projects closely related to the situation we try to create, and we try to stay away from simplification.

As an example old containers and useless packaging had accumulated over a period of years on a hill on which our upper warehouse was located. Why not pretend this is a disaster site! And so we decided to bring this pile down for training purposes, using it in special tactical exercises for composite and rescue groups. The results were good. Performing their combat training missions, the warriors and commanders worked with full effort, surpassing the standards.

When we include such elements in the exercise plan we usually also calculate the economic impact in rubles, which is also important from the standpoint of the requirements of the 26th CPSU Congress: The economy must be economical. But the main impact in this case is that the quality of training rises.

Emergency situations arising for one reason or another are used to train the technical emergency civil defense group headed by V. Migal', a foreman of the mechanical repair shop. Thus one winter the power supply piles of the cranes were inundated, and there was the possibility that they would have to stop working. This incident coincided in time with a special tactical lesson. And so the group commander decided to incorporate the emergency restoration work into the lesson. During the actions, which proceeded according to a well conceived plan, the formation commanders and warriors removed water and ice from the piles, repaired them and sealed them off. One other time the technical emergency group restored a damaged heat pipe and repaired a boiler plant during an exercise.

We started the present training year better organized and more purposefully due to the experience we had acquired. A socialist competition for effectiveness and quality in training has assumed broad scope. In addition to the production pledges adopted by the entire labor collective, pledges were also adopted by all nonmilitary formations in honor of the 60th anniversary of the USSR and the 50th anniversary of USSR civil defense. It is important to note that the Komsomol and trade union organizations, the DOSAAF committee and active members of the "Znaniye" society take an active part in civil defense functions. Concrete tasks are foreseen for them in the training plan and in the plan for party-political work, and these tasks are carried out successfully. Thus the trade union port committee (chairman, V. Tkach) provides considerable assistance to organizing socialist competition between formations and training groups, to acquiring training aids and to equipping classrooms and civil defense nooks. The Komsomol committee (secretary, G. Zadorozhnyy) explains the aims and tasks of civil defense to young people. Komsomol members are active warriors of nonmilitary formations, and there are an especially large number of them in the voluntary aid detachment.

Led by V. Myagkov, party bureau deputy secretary for ideological work, active members of the "Znaniye" society's primary organization regularly give lectures and conduct discussions on civil defense issues. And the DOSAAF committee (chairman, V. Bankin), coordinates public defense work with civil defense functions, constantly assisting the staff in organization of civil defense propaganda. The latter is under the direct management of Communist V. Kolychev, the facility assistant civil defense chief of staff.

The bulletin "Civil Defense," which summarizes the best training experience, is published quarterly. The facility broadcasting system regularly transmits discussions on civil defense topics. Preparations are being made to release a motion picture made locally by active members of the movie and photo club.

Of course, we still have many difficulties and unsolved problems. In particular, we are experiencing delays in the construction of a block of service and personal buildings intended for use as civil defense training, medical and decontamination centers. This should significantly supplement our training material base. I think that during the port's forthcoming reconstruction, we will complete not only this but also other tasks connected with ensuring dependable protection of the labor collective.

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CIVIL DEFENSE TRAINING WITH NONWORKING POPULATIONS DESCRIBED

Encouraging Lesson Attendance

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 20

[Article by Major General Ye. Kuz'menko: "Knowing How to Capture People's Minds"]

[Text] Teaching people not involved in production and in the services the methods of defending against mass destruction weapons and other attack resources is a difficult business. The greatest difficulty lies in the fact that it is hard to attract people to lessons. After all, we are dealing basically with pensioners and housewives. It is not all that easy to get them together.

I was persuaded that this task could be completed successfully by assuming an attitude of high responsibility, a creative attitude toward the effort. Here in the Ukraine, executives of a number of housing administrations and town soviets use various means to attract the nonworking population to civil defense lessons. Thus for example, in summer the lessons are conducted outside. And as we know, pensioners love to sit near their homes and gossip in late afternoon. What if they were to be gathered together for a discussion of civil defense, and what if it were explained to them how important it is to know the ways of protecting oneself and one's children? This approach did work in some housing operation administrations and ZhEKs [housing operation offices] of L'vov. People were made interested in these discussions, and they began gathering together in the squares. Then study groups were created. The times when it was most convenient for the people to come to the lessons were accounted for, and the lesson schedule was drawn up. The method of instruction used here is simple: narration, demonstration and practical performance.

Some groups organized by the ZhEKs of Leninskiy Rayon in the city of Nikolayev consist of residents living in the same house or sharing the same entrance way and, in the private housing sector, the residents of a certain street. Age, education and health are taken into account in this case. Disabled war and labor veterans are brought together into separate groups. Discussions and training films make up the basis of the lessons. The students learn to use gas masks, cotton gauze dressings and fabric dust masks. Lesson attendance and assimilation of the material are good.

The main lessons conducted in the housing administrations of Ordzhonikidzevskiy Rayon, Khar'kov are organized in winter in well equipped classrooms. By decision of the rayon civil defense chiefs, a training ground and a shelter were assigned to these groups. The rayon civil defense staff provided visual aids to the lesson leaders and furnished slides. All of this raised interest in the lessons. The composition of the study groups is kept the same for summer. Only the forms of training change. The people are periodically brought together outside in the summer to view civil defense training films and conduct discussions, and sometimes competitions of sorts are run: Who can make a cotton gauze dressing or don a gas mask the fastest, and who can answer quiz questions correctly?

Before creating the study groups, workers of Housing Operation Administration No 1 of Leninskiy Rayon, Chernovtsy visited all pensioners, talked with them, and determined who could come to the lessons. A training center was outfitted with visual aids and literature. Those who for some reason could not attend the lessons were given a pamphlet titled "This Is What Everyone Must Know and Know How To Do," which they were asked to study on their own. Every study group leader is assigned his own pensioners whom he periodically visits to answer their questions.

"Very much depends on the first meetings with the students," said K. Berezin, Pervomaysk civil defense chief of staff, Nikolayevskaya Oblast, "on how well we manage to persuade them of the need for learning about the ways to protect against modern weapons, and to gain their interest. The very first discussion must be inspiring, and it must be frank. Tell the grandmothers and grandfathers that it may happen in their lives that the fate of their grandchildren would hang upon their knowledge and abilities, and then they will come over to your side, and be active students."

Recently I attended lessons in one of the ZhEKs of Kiev. An elderly woman was distressed by her poor memory.

"Don't worry," the lesson leader soothed her. "You'll gradually memorize everything you need to know. The main thing is to learn how to use the gas mask, to make a cotton gauze dressing and to respond correctly to civil defense warning signals. We will practice all of these actions together."

"If a teacher is liked, people will attend his lessons, but if he is not liked, no one will come. The most important quality of any organizer," noted V. I. Lenin, "is the capability of attracting people. One can be persuaded of this time and time again by acquainting oneself with group leaders."

Workers of the local civil defense school helped select leaders for study groups in Odessa's Primorskiy Rayon, recommending reserve and retired officers who were most knowledgeable about civil defense and who possessed teaching skills. Before the start of the new training year, they all underwent training in the rayon school.

In rural areas, lessons are held in winter as a rule. Pensioners and housewives are invited by radio to the local club or the Palace of Culture for a general meeting. In such a meeting the leaders of the town soviets acquaint them with the civil defense tasks and with the training plans, and they introduce them to the lesson leaders. Then the students who live on the same street or in the same block are brought together into study groups (of 12-15 persons each).

It should be stated that it is even more difficult to hold such lessons in rural areas than in the city. It is difficult for many people to get to the club, especially in the evening, and moreover in inclement weather. This is why study is organized at home in some towns. The lessons are led by 10th grade students who are well trained in civil defense.

The training given to the nonworking population of the Tarakanovsk Town Soviet, Rovenskaya Oblast is managed personally by the chairman of the executive committee, Lidiya Fedorovna Velichko. She often meets with the pensioners, attends the lessons, talks with them and answers their questions. Kolkhoz pensioners respect her, and they go to the lessons regularly. The leaders of the study groups were selected thoughtfully here as well. As a rule these are authoritative people who know how to conduct discussions with their students. One of them, S. Dovgal', the leader of a construction team, is a literate, restless and energetic person. People readily come to him for lessons. He usually begins the lessons by providing information on the affairs of the kolkhoz. This takes 5-7 minutes.

The Beloshevsk Town Soviet, Kovel'skiy Rayon, Volynskaya Oblast has also managed to attract the nonworking population to civil defense lessons. The focus in the lessons is on practical work, work providing the greatest benefit. Usually the leader tells the students what they will be doing next time. For example he may tell them that they will meet with a physician or a school teacher, or they will participate in conversion of a cellar into a radiation shelter, or they will help to seal off a house or a well. This tactic has great significance to increasing attendance. The students become interested beforehand in the next lesson.

There are many examples in which people not involved in production or in the services actively participate in integrated facility exercises with the purpose of reinforcing their civil defense knowledge. For example residents of the town of Zhovtnevoye, Bolgradskiy Rayon, Odesskaya Oblast participated actively in an exercise. They sealed off residential buildings and apartments, they adapted basements and cellars as radiation shelters and they made cotton gauze dressings.

Trust in the people inspires them, eliciting their desire to be useful to society, to learn what must be done to protect against mass destruction weapons.

I am not at all implying, of course, that we have solved all problems of training the nonworking population in the republic. Shortcomings in organization and in material support to lessons make themselves known, sometimes causing their failure. We usually encounter such cases in rural areas. But as experience shows, if ZhEK and town soviet executives display organizational capabilities and efficiency, they find it fully within their power to eliminate such shortcomings. And in turn, they have the right to count on active assistance from the civil defense schools and staffs, from the party organizations and from the workers of medical, cultural and educational institutions. This is, after all, everyone's business.

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Examples of Civil Defense Training

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 21

[Article by V. Korotkevich, senior instructor, Gor'kovskaya Oblast Civil Defense School: "In a Single Complex"]

[Text] A certain amount of experience has already been accumulated in Gor'kovskaya Oblast in teaching the methods of protecting against mass destruction weapons to people not involved in production and in the services. This is particularly true in Dzerzhinskiy Rayon (civil defense chief--G. Repin; chief of staff--A. Povstyanoy). The party and soviet organs of this rayon view organization of the training of the nonworking population as an inherent part of a single complex of tasks associated with improving and strengthening civil defense. It has become the practice here to discuss these issues in the executive committee of the rayon Soviet of People's Deputies, in sessions of the executive committees of the town and village soviets and at communist meetings. Teacher training rallies are conducted before the start of each year with the civil defense chiefs of the village and town soviets and their supernumerary chiefs of staff.

As a rule the results of the training given to the nonworking population in the past training year are summarized, training progress is thoroughly analyzed and the tasks of the new training year are set. Demonstration lessons are given in certain subjects. Much attention is devoted to selecting and training lesson leaders--especially to developing their ability to conduct practical lessons. It has now become the rule in the rayon to hold two-day rallies for new lesson leaders at the beginning of the training year. One-day rallies are held for leaders with some experience. Permanent control over the progress of training afforded to this population group by the civil defense staff has been organized as well.

By decision of the executive committee, all students in the Babino Town Soviet, Dzerzhinskiy Rayon are united into population center study groups. Regular days and permanent study places (schools, Red Nooks, agitation points) have been established. Each group has its own schedule and a lesson accounting log. The lesson leaders are selected especially carefully. Lessons are conducted competently by, for example, reserve officers and veterans of the Great Patriotic War M. Kartashov, A. Shuleshov, K. Kurnosov and L. Sharov, school director P. Solov'yev, school military instructor A. Kuzhdeyev and others. The town soviet chairman himself, G. Gvozdev, conducts lessons as well. And it should be noted that he has managed to elicit lively interest in the material being studied in people of various ages and levels of education.

Training of the nonworking population is also well organized in the Zolinsk village and the Krasnaya Gorka and Zhelnino town soviets of this rayon.

Training of the nonworking population is not proceeding badly in the cities of Vyksa, Dzerzhinsk and Kulebaki, in Kanavinskiy, Moskovskiy and Sovetskiy rayons of the city of Gor'kiy, and in Shatkovskiy, Lyskovskiy and Tonshayevskiy rural rayons. In Kanavinskiy Rayon, as an example, party meetings devoted to the tasks of the communists in organizing civil defense training for the nonworking population were conducted in all party organizations of the housing organs before the start of the training year. Workers of the rayon civil defense staff and school and the executives and chiefs of staff of the housing organs and national economic facilities gave reports at these meetings.

Of course it is not easy to organize lessons for the nonworking population. But these difficulties are successfully surmounted by those housing organs which make an honest effort. Thus N. Naumov, chief of Sovetskiy Rayon's ZhEU [Housing Operation Administration] No 8 and civil defense chief of staff G. Prokof'yev did a great deal of organizational work to draw up lists of the residents, they broke them down into study groups, they selected the lesson leaders, they made an effort to improve their teaching skills, they drew up lesson schedules, and they are now keeping records on the lessons. A training classroom was set up with the help of the public. The ZhEU's Red Nook is used for lessons, while in summer the agitation squares and protective structures are used. Lessons are conducted by war and labor veterans and by workers of the ZhEU, while self aid and mutual aid are discussed by medical workers, the advice of whom the students also utilize in their daily lives. The lesson leaders received the necessary training in the rayon civil defense school. There are sufficient quantities of training and visual aids. There are gas masks, simple resources for protecting the breathing organs, posters and filmstrips.

It would be interesting to note that on the initiative of G. Prokof'yeva a public committee that takes an active part in organizing and preparing the lessons has been created. The people study diligently, they practice the ways and means of protecting against mass destruction weapons, and they train in the manufacture of the simplest resources for protecting breathing organs.

But unfortunately such training is not afforded to the nonworking population everywhere. Even in rayons where good examples could be found, the latter are not generalized, and they are not introduced into daily life. In some places training has still not been seriously organized for the nonworking population. As an example the Kamenskiy Village Soviet of Bogorodskiy Rayon was an example of civil defense organization, as well as of training the nonworking population. But the civil defense leadership of the rayon and the village soviet changed. The newly elected chairman of the village soviet, A. Kashirin, refused to participate in civil defense tasks, and all that had been done in civil defense, to organize the training of the nonworking population, was forgotten. And nothing was done to correct the situation by the civil defense chief of Bogorodskiy Rayon, Yu. Yemel'yanov or by the chief of staff, V. Kuz'michev. The time has obviously come to hear out the village soviet's civil defense chief at an executive committee meeting. We cannot ignore such cases; passing judgement on them, we must stick to our principles.

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DOSIMETERS DISCUSSED

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) p 23

[Article by G. Odzhagov and A. Nagornyy: "A Replacement for the DP-100"]

[Text] Civil defense staff workers have the uneasy task of determining and measuring contamination of water, foodstuffs, forage and other material resources following nuclear explosions. The difficulties of determining contamination lie in the fact that the measurements must be made in the presence of a very complex mixture of radioactive isotopes, the beta-emission spectrum of which is broad, variable over over time and depends on the type of nuclear weapon and form of burst.

At the same time the methods of determining contamination must be rather sophisticated and precise, so that in addition to qualitative information, they could also provide quantitative measurements of contamination. This task can be completed only with the help of more-sophisticated dosimetric instruments. DP-100-AD-M and DP-100-M decimal counters are used in the civil defense system for these purposes. However, despite their high reliability, they are already obsolete today. This is why industry has stopped supplying spare parts for the DP-100. This can also be explained in part by the fact that certain parts used in the unit have been removed from production--the MST-17 counter, miniature radio tubes and so on.

At the moment our industry is traveling the road of unification and standardization in its effort to develop the nomenclature of dosimetric instruments. This means that there is no need for combining blocks serving different functions in the same unit. Therefore a broad range of narrowly specialized instruments with improved economic, ergonomic and technical characteristics was developed. Thus it became possible to successfully replace the DP-100 unit by practically any series "PP" counting instrument . We use a PP-9 unit for radiometric measurements in our laboratory, since it is universal--that is, it is not intended for some particular form of counting. The comparative characteristics of both units are shown in the table below.

As we can see from the table, the PP-9 is superior to the DP-100 in relation to all indicators except one: The PP-9 unit is not intended for use in the field. This of course is its serious shortcoming. But the fact that it is made from modern components (transistors) noticeably raises its reliability.

Technical Characteristics	DP-100	PP-9
Recording volume	10^5 pulses	10^6 pulses
Input pulse duration range	20 μsec-1,000 μsec	10 nsec-10 μsec
Maximum pulse counting frequency	$15 \cdot 10^3$ pulses/sec	$5 \cdot 10^6$ pulses/sec
Unit's input sensitivity	2-100 volts	0.1-10 volts
Operating temperature range	(-10)-(+50)°C	(+10)-(+35)°C
Consumed power		60 watts
Information output	Neon indicator lamps	Luminescent symbol displays with arabic numbers
Automatic time exposure	No	Yes
Automatic pulse count exposure	No	Yes
Suitable use	Laboratory and field	Laboratory
Weight of complete unit	150 kg	100 kg

For the unit to be complete, however, it also needs a lead housing, a high-voltage power supply unit, a counter and a cable. While there is no problem in acquiring the high-voltage power source since it, as is true with the lead housing, is produced by our industry, the matching unit and its power source have not yet gone into series production.

Considering this situation, specialists of the civil defense staff of the Azerbaijan SSR proposed two variants of the use of "PP" units in place of the DP-100.

In the first variant (Figure 1) the outfit includes: PP-9 unit ; industrial-voltage power supply unit (we use a PV-2-2); voltmeter; lead housing from a DP-100 unit together with an SBT-7 counter and a matching unit, assembled in the laboratory and fit within a housing taken from the DP-100's matching unit. In this case power is picked off from the PP unit at the 8 volt test voltage socket.

In the second variant (Figure 2) the complete outfit includes: PP-9 unit; the high-voltage block (voltage converter) and the matching unit and their common power supply unit, assembled in a single small housing with 185×105×130 mm dimensions. The block is designed in such a way that it is easily secured to the lead housing by means of standard plug connections from dosimetric instruments. The outfit also includes a lead housing from a DP-100.

In both cases the radiometric measurements are made by means of the procedure employed with a DP-100.

Because this procedure is intended for an MST-17 counter, which is no longer in production, we introduced a correction factor accounting for the difference in sensitivity between the MST-17 counter and the SPT-7 counter we use. However, if another type of counter is used, the correction factor must be recalculated for each other type.

We suggest using the first variant wherever it is impossible for some reason to acquire scarce parts or assemble rather complex electronic devices. The shortcoming

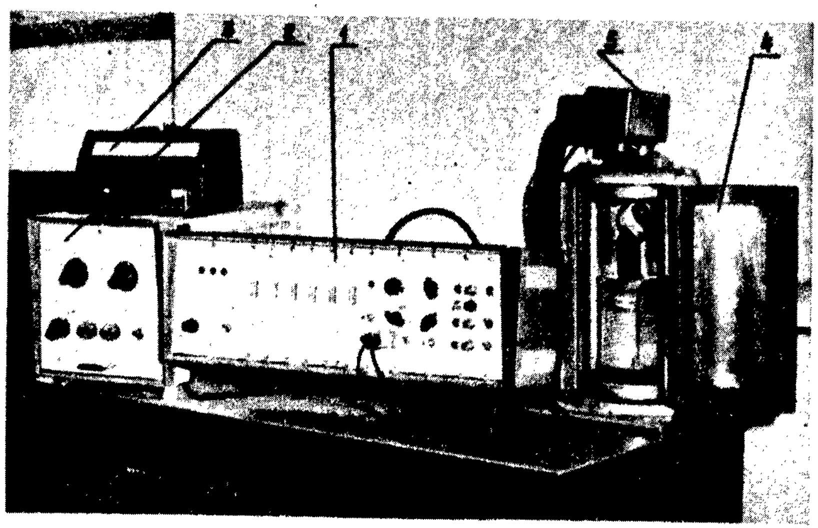

Figure 1. Variant of the Complete Outfit of the PP-9 Unit: 1--PP-9 unit; 2--industrial high-voltage power supply unit; 3--voltmeter; 4--lead housing; 5--matching unit

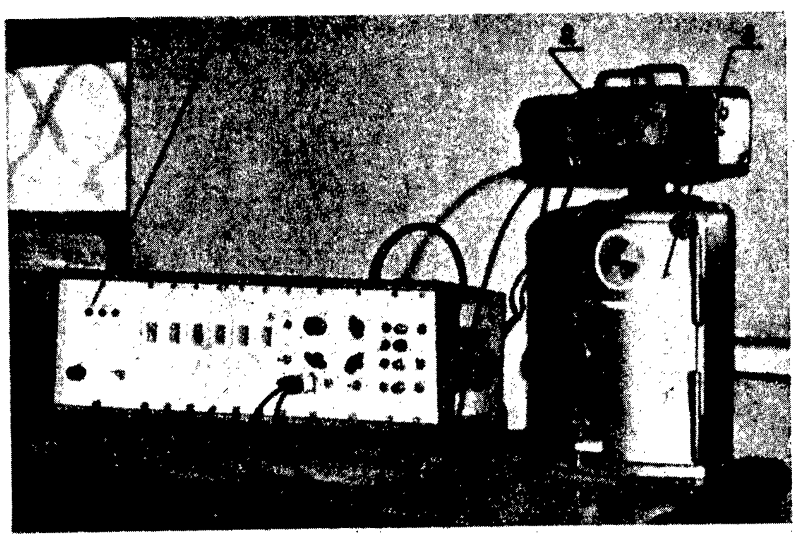

Figure 2. Second Variant of the Complete Outfit of the PP-9 Unit: 1--PP-9 unit; 2--high-voltage unit, matching unit and their common power supply block; 3--lead housing

of this variant is its large size. Its advantage lies in the simplicity of manufacture of the matching unit and the absence of scarce parts. One other significant shortcoming of the first variant is the absence of a monitoring arrow-type voltmeter on some industrial high-voltage power supply units, which makes it difficult to determine the counting characteristic of the gas-discharge counter and to effectively monitor the high-voltage potential. This is why a monitoring voltmeter must be added to the measuring circuit, which increases the dimensions of the entire unit even more.

The second variant is totally devoid of these shortcomings. Under otherwise equal conditions, the overall dimensions and weight of this unit are even somewhat smaller than for the DP-100.

We believe that introduction of PP-9 units will make it easier to complete the tasks facing civil defense radiometric laboratories.

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FIREFIGHTING EQUIPMENT DESCRIBED

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) pp 24-25

[Article by Lieutenant Colonel of Internal Service V. Yukhimenko, senior engineer-inspector, Main Administration of Fire Prevention, USSR Ministry of Internal Affairs: "If a Fire Starts in the Country"]

[Text] Each year our country's agriculture receives sizeable numbers of diverse modern vehicles. But unfortunately, the availability of fire trucks and motor-driven pumps in the kolkhozes and sovkhozes is low. This is why it would be expedient to adapt agricultural equipment to fight fires. The experience of many farms shows that this does not require great outlays. We will look at the most widespread vehicles and machine units suited to such adaptation as an example.

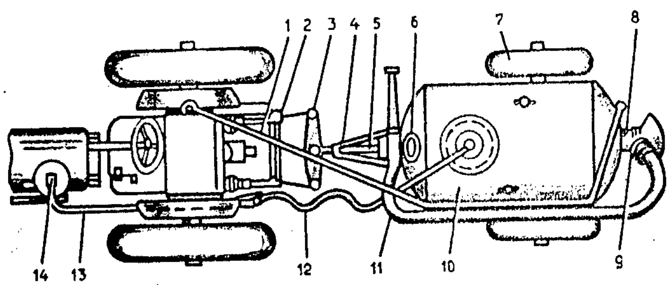

Figure 1. RZh-1.7A Single-Axle Liquid Manure Spreading Tractor: *1*--valve tie rod; *2*--tractor pumping system; *3*--crossbeam; *4*--frame; *5*--support; *6*--peephole; *7*--wheel; *8*--valve; *9*--distributing unit; *10*--tank; *11*--filling hose; *12*--evacuating line; *13*--pipe; *14*--ejector

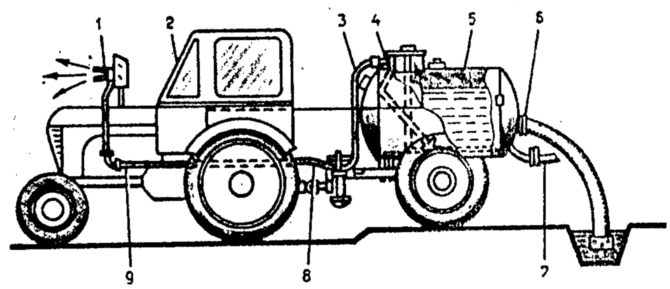

Figure 2. ZZhV-1.8 Vacuum Liquid Manure Loader-Spreader: *1*--ejector; *2*--tractor; *3*--pipe; *4*--level gauge; *5*--tank; *6*--filling hose; *7*--central irrigating chute; *8*--reinforced hose; *9*--pipeline

The RZh-1.7A single-axle liquid manure spreading tractor (Figure 1). To deliver water to a fire, a T-branch is attached to the manure spreader's dispensing unit, and a rubberized fabric hose is attached to the T-branch. The tractor's engine exhaust is channeled into the tank, for which purpose the ejector's louvers are shut, and the tie rod is used to open the valve of the filling unit.

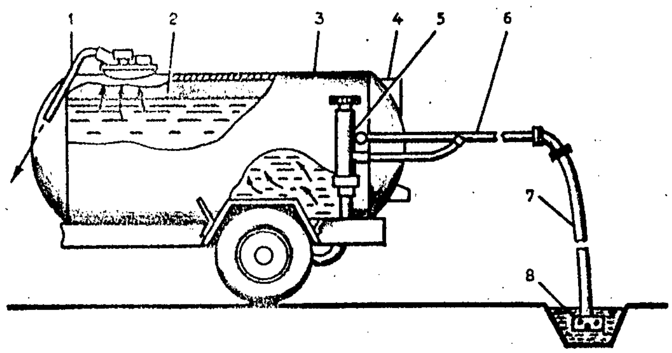

Figure 3. Filling an RZhU-3.6 Liquid Fertilizer Spreader With Water: *1*--pump pipeline; *2*--air pocket; *3*--tank; *4*--peephole; *5*--hydraulic cylinder; *6*--fueling rod; *7*--filling hose; *8*--water source

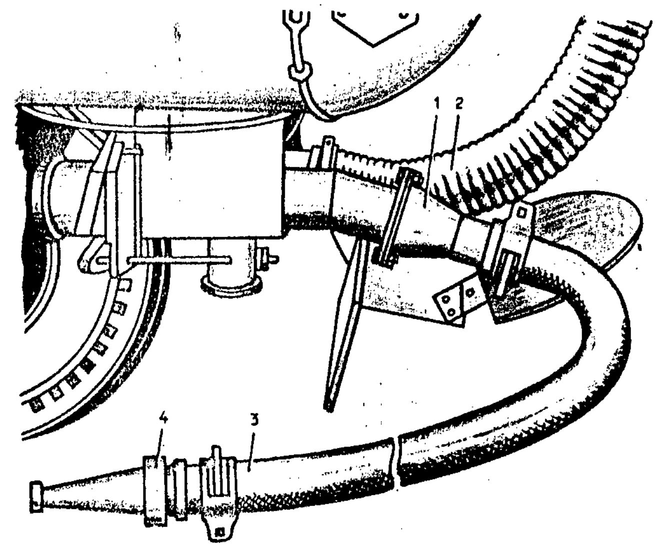

Figure 4. Pressure Switching Unit: *1*--exchangeable adapter; *2*--swing bolt with wing nut; *3*--rubberized fabric hose; *4*--monitor nozzle

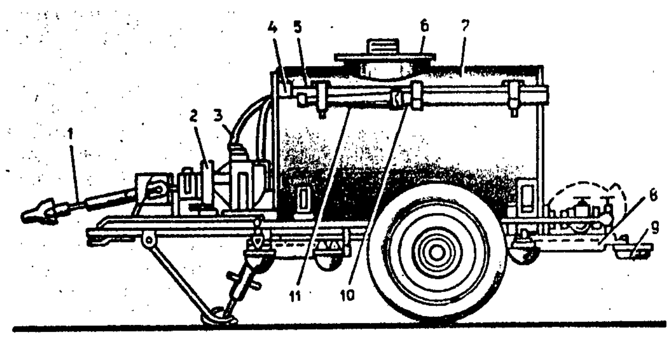

Figure 5. PAP-10A Self-Waterer: *1*--Cardan shaft; *2*--pump; *3*--drain hose; *4*--filter; *5*--filling hose; *6*--spout; *7*--tank; *8*--frame; *9*--PA-1 waterer; *10*--drain hose connecting head; *11*--RS-50 nozzle

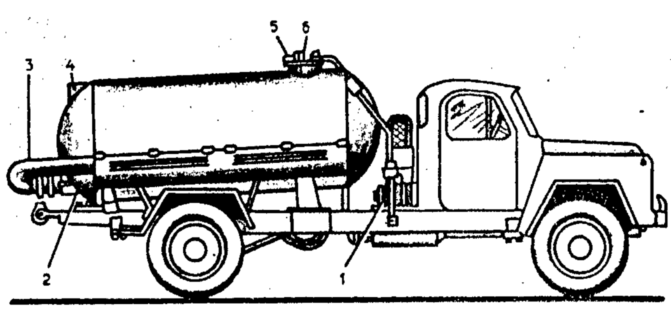

Figure 6. ANM-53 Sewage Disposal Truck: *1*--pump; *2*--intake hatch; *3*--filling hose; *4*--peephole; *5*--spout; *6*--safety valve

For safety purposes creation of excess pressure in the tank is prohibited when operating the liquid manure spreader if the valves are closed; repair of units when the tank is under pressure is also prohibited.

The ZZhV-1.8 vacuum liquid manure loader-spreader and the ZU-3.6 loader (Figure 2). To deliver water, a rubberized fabric hose is connected to the T-branch of the dispensing unit, and the door across the outlet of the ejector's mixing chamber and the door in the ejector housing are closed. The tractor's engine shaft RPM is raised, and the valve of the dispensing unit is opened. Water is delivered through one hose line, and the second opening in the T-branch of the dispensing unit is plugged.

The RZhU-3.6 (Figure 3), RZhT-8 and RZhT-16 liquid fertilizer spreaders. To deliver water from the tank of an RZhU-3.6, a T-branch is screwed into the dispensing unit, and a rubberized fabric hose is connected. The second opening in the T-branch is plugged. The transfer case and the hydraulic motor are turned on, as a result of which an excess pressure of 0.7 atm is created in the tank with the pump, and the outlet valve is opened.

To deliver water from an RZhT-8 or an RZhT-16, a hose must be connected to the distributor outlet after first removing the exchangeable adapter (Figure 4) using the swing bolts and wing nuts. Then the shaft of the tractor's transfer case is connected to the delivery pump drive. The lever on the tractor's hydraulic distributor is raised to its upper position, and the gate is opened. These machine units can be used successfully to extinguish fires on peat and grain fields, and they can be used to transport and store foaming and wetting agents.

The VR-3M water dispenser and the PAP-10A and AO-3 mobile self-waterers (Figure 5) are filled from water basins through their spouts by a pump. To deliver water to the drain hose, which has a connecting head, a nozzle is connected to its end, or when they are available, a 51 mm diameter pressure fire hose and nozzle are attached. The pump is filled with water through the hole in its housing or through the filling hose, which is lowered into the tank through its spout. Then the tractor's transfer case shaft is engaged, and the fire can be put out as soon as water reaches the nozzle.

The ANM-53 sewage disposal pump unit (Figure 6), which is mounted on a GAZ-53A chassis, is equipped with an adapter head, a 51 mm diameter pressure fire hose and a 13 mm nozzle. The adapter head may be made in local repair shops.

The tank is filled with water from the water supply network or from a water basin, into which the filling hose is lowered. A negative pressure is created in the tank when the pump is turned on. When the water reaches the top of the peephole the intake hatch is closed and the pump drive's transfer case is disengaged. Incidentally, the engine could also be stopped automatically by means of a warning-safety device.

To deliver water from the tank, a pressure fire hose is connected to the filling hose, the valve handles on the pump pipelines are set in "evacuation under pressure" position, the intake hatch is opened, the pump is turned on, and an excess pressure of 0.5-0.6 atm is created in the tank. The valve of the fire nozzle is opened, and water is sprayed on the fire.

Wherever special firefighting equipment is unavailable, adapted vehicles are included in the fighting crews of the nonmilitary firefighting formations. A yellow stripe 230 mm wide is applied to the side doors of such vehicles and machine units, and the words "Adapted for Fire Fighting" are painted on this stripe in black.

Technical maintenance is performed on this equipment by the farm engineering service, and the preparedness of this equipment is monitored by the chiefs of nonmilitary fighting formations, fire-spotting detachments, and the volunteer fire departments of sovkhozes and kolkhozes.

Fire pumps and other equipment are installed on motor vehicles adapted for fire-fighting at the farm on coordination with local organs (inspections) of the Gossel'tekhnadzor [not further identified], the State Motor Vehicle Inspection and the State Fire Inspection. These same organs also provide special training for drivers and for persons servicing this equipment.

Personnel of nonmilitary firefighting formations taking an active part in fire-fighting may be granted privileges foreseen by a decree of the USSR Council of Ministers published 2 March 1954, "On Organizing Volunteer Firefighting Detachments at Industrial Enterprises and Other Facilities of Ministries and Departments."

The following question may arise: How is the reoutfitting and adaptation of equipment to be financed? After all, there are some expenses, small though they may be. The reply to this question can be found in the RFSFR Council of Ministers 9 October 1978 decree "On Mandatory State Insurance for the Property of Kolkhozes, Sovkhozes and Other State Agricultural Enterprises": The work is financed by deductions from insurance payments.

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LECTURE ON RESCUE WORK

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) pp 26-27

[Article by I. Ivanshchenko, military instructor, public inspector-methodologist: "Subject 5: Rescue Operations"]

[Text] The program recommends conducting all three lessons in the subject "Rescue Operations in Centers of Nuclear Destruction" as theoretical lessons. The filmstrips "Rescue and Emergency Reconstruction Operations in a Center of Nuclear Destruction" and "Repair of Damage to Utility and Power Networks" and the appropriate civil defense chart (for ninth grade) can be used as training and visual aids. Preparing for the lessons, the military instructor reviews the filmstrips and determines which frames he intends to show the students, and he thinks out the best way to present them and the accompanying narration.

Lesson 1

Before beginning presentation of the first study question (the tasks performed in rescue operations in a center of nuclear destruction, and their brief description), the military instructor must ask questions to ascertain that the students have a good idea of what the features of a center of destruction are and of the situation within which rescue workers would have to act. Next he defines what rescue operations are and explains that the work is subdivided into rescue and emergency reconstruction operations. The first include, in particular, reconnaissance of the routes of travel and sectors (objects) of operations.

Before the rescue detachments (groups) arrive, a scouting party determines the radiation level, seeks out entrances to shelters and emergency exits from them, establishes the nature of damage to structures and determines the condition of people within them. Containment and extinguishment of fires along the routes of travel and in the sectors of operations in which firefighting and other formations participate are organized with the purpose of providing support to the actions of civil defense forces.

Search and rescue of people is initiated as soon as the formations reach the center of destruction. The places where people may be located are carefully examined--protective structures, basements, areaways and stairwells, etc. The rescue workers periodically emit loud signals, vocally or by striking structures within the debris or surviving parts of buildings, in order to establish contact with casualties and determine their number and condition.

Digging out destroyed, damaged and obstructed shelters, feeding air into them and rescuing people from them are all included in the "rescue operations" concept as well. Buried shelters are sought using available building plans as well as on the basis of typical external signs, for example the caps over emergency exits. If a shelter's filtered-ventilation system is damaged, fresh air must be fed in on priority. This is another responsibility of the rescuers.

Civil defense forces engaged in rescue operations include medical formations which provide first aid to casualties right within the destruction center. The last measures implemented include removal of people from dangerous places to safe areas on foot or by vehicle, personal cleansing of casualties and decontamination of their clothing as well as of land, structures, transportation and equipment.

The military instructor devotes about 7-10 minutes to presentation of the first study question. He devotes a little more time to the second question--the men and equipment used in rescue operations.

First of all he should explain to the students that rescue operations are conducted in a center of nuclear destruction by military subunits and nonmilitary civil defense formations. Some of them were already mentioned in the presentation of the first study question.

Using the filmstrip "Rescue and Emergency Reconstruction Operations in a Center of Nuclear Destruction," the military instructor acquaints the students with the organization and purpose of some of the formations.

The rescue detachment (frame 3) or team is created out of laborers and white collar workers of a particular facility. Outfitted with detection instruments, communication resources, tools and equipment required for rescue operations, these formations seek out and extract casualties from rubble and from destroyed and damaged shelters in order to provide medical assistance. Firefighting teams (frame 4) are formed out of volunteer firefighting detachments and fire safety workers. They perform fire reconnaissance, and they put out fires along the routes of travel and within the center of nuclear destruction. Decontamination teams (frame 5) are basically created out of laborers and white collar workers who are associated, by the nature of their activity, with the processing and storage of toxic substances. Their job is to decontaminate land and equipment, and they are provided the required equipment for this purpose. Discussing formations such as technical emergency teams, medical teams, reconnaissance groups and communication groups, the military instructor shows frames 6-9 of the filmstrip.

It should be emphasized that civil defense forces will have powerful equipment at their disposal. Such equipment includes construction and road building machinery and mechanisms, municipal maintenance equipment, and technical resources at the disposal of national economic facilities. Frames 10-13 of the filmstrip acquaint the students with some of this equipment. The principal forms of rescue operations, meanwhile, are described on a poster.

Going on to the third study question, the military instructor emphasizes that emergency reconstruction operations are conducted in order to ensure swift rescue of people, to restore the vital activities of cities (facilities) by containing damage to utility and power network and making repairs, and so on. Such operations include, in particular, laying track-ways and clearing passageways through obstructions, reinforcing and razing structures threatening to collapse, temporarily restoring damaged communication lines and repairing and reconstructing damaged shelters in the event of possible second nuclear strikes by the enemy (frame 18).

Motor roads are used to convey civil defense forces to the objects of their rescue operations. When roads are absent or when they are impossible to use, track-ways are laid to permit access to the work areas. Clearing passageways through obstructions for vehicle and foot traffic is the most important prerequisite of prompt initiation and successful conduct of rescue operations.

Large chunks of earth, girders and reinforcement metal are pulled apart by truck-mounted cranes and tractors, after which they are cut apart with autogenous welders or broken down with explosives. Unstable structures threatening to collapse are reinforced by props or by cable bracing, or they are razed (the filmstrip "Rescue and Emergency Reconstruction Operations in a Center of Nuclear Destruction," (frames 19-25).

The first thing to do to contain damage to gas, power, water, sewage and utility networks is to turn off the damaged sections. Thus valves are closed on water and gas pipelines, and knife switches are turned off in power networks. Then steps are taken to correct the damage. If damage is discovered in water, heat or sewage lines passing near a shelter and if there is a threat of the latter's flooding, water is pumped away while the damage is repaired. All of these operations are performed as a rule by appropriately equipped formations of the civil defense technical emergency service. However, general-purpose formations and the able-bodied population can also be called in to help them. Frames of the filmstrip "Repair of Damage to Utility and Power Networks" (2-8, 14, 18-21, 26-33, 37-42) can provide a visual illustration of the discussion of this question.

Lesson 2

This lesson is devoted to studying the ways and means of rescue operations. First of all the military instructor determines how well the students have assimilated the material of the first lesson.

The purpose of reconnaissance was already discussed in Lesson 1. At this point the military instructor emphasizes that reconnaissance is the most important form of support to the actions of civil defense forces. Its aim is to obtain dependable and complete information on the situation within the shortest possible time. This information is used as a basis for making the decision to initiate rescue operations in the destruction center and to use protective resources. Reconnaissance can achieve its goals if it is conducted actively, continually and promptly, and if the information it submits is reliable. Reconnaissance is divided into air, river (marine) and ground depending on the means by which the information is obtained and the resources used. The students will learn more about reconnaissance and its objectives and methods in the lessons on subject 10.

The students should be acquainted somewhat more extensively with the other ways and means of conducting rescue operations. In particular the military instructor should describe the methods used to contain and extinguish fires. These include, for example, directing powerful streams of water from hand-held hoses and monitors, and using mechanically generated foam. Primary firefighting resources--internal fire hydrants, hand sprayers, fire extinguishers and so on--can be used successfully to extinguish small fires.

People are rescued from partially destroyed burning buildings by engineer, fire-fighting, medical and other formations. People are evacuated from burning buildings through surviving internal staircases and permanent fire escapes. Mechanical fire ladders, rescue ropes and other resources are used to evacuate casualties from upper stories (frames 15-17 of the filmstrip "Rescue and Emergency Reconstruction Operations in a Center of Nuclear Destruction").

The military instructor already emphasized in the first lesson that attention is turned in rescue operations primarily to the possible places of accumulation of people, shelters in particular. Obstructed shelters are dug out and opened by general-purpose formations (composite and rescue detachments, squads and groups) reinforced by technical emergency formations.

Reconnaissance is conducted to determine the most suitable way of digging out and opening a shelter. Rubble is usually cleared from an emergency exit by an excavator, truck-mounted crane or bulldozer, or by mechanized tools. If it is difficult to dig out an entrance or an emergency exit in a short period of time, the shelter can be opened up by punching a hole (crawlway) through its walls. For this purpose the least obstructed portion of the wall is sought out--for example a wall separating the shelter from the basement. Rubble is cleared away from the outer wall, an areaway is dug out, and then a crawlway is punched through (frames 19, 21-24).

If the filtered ventilation system of a shelter is damaged, formations immediately see that air is fed in. A hole is punched through the roof or walls for this purpose. Air is pumped in by portable ventilation units and compressors. The air is initially purified of radioactive dust by passing it through a dust filter (frame 20).

The entire previous discussion dealt primarily with rescuing people in a center of nuclear destruction. Rescue operations would be effective only in the event that medical assistance is promptly provided to the casualties. This is the responsibility of personnel of the medical team, which operates jointly with the rescue formations and with stretcher-bearing squads having the function of evacuating casualties. Self- and mutual aid rendered by the public will also have great significance in cases of mass casualties. This is why everyone must master its procedures.

Casualties are evacuated after first aid is rendered to them. Those who require a physician's care are conveyed to motor transportation loading points and delivered to first aid detachments and medical centers. When transportation is lacking, light casualties travel to medical centers on foot, on their own or with escorts (frames 32-36).

After their work is completed, the population and formation personnel leave the center of destruction for regions with lower radiation levels or for uncontaminated areas. Here they undergo personal cleansing, their clothing, footwear and protective resources are decontaminated and so on (frames 39-43). This information will be covered in greater detail in lessons of subject 8.

Lesson 3

Having questioned the students and assured himself that they have assimilated the material of the previous lesson, the military instructor goes on to the subject of the new lesson. He emphasizes that although the situations encountered in a center of nuclear destruction may be quite diverse and sometimes unexpected, and consequently it would be impossible to foresee all of the difficulties, steps are nevertheless taken beforehand to ensure the safety of people conducting rescue and emergency operations and to prevent accidents.

Danger areas near damaged buildings and structures are determined and barricaded off prior to work for this purpose. Warriors are prohibited from working and being present in debris alone. Safeties are assigned to persons working in partially destroyed buildings and in rooms filled with gas and smoke. Work on electric power lines is prohibited until their power sources are disconnected. At night, lighting fixtures are set up, and lights are used to mark off places where pits are being dug in debris, zones of possible collapse and other dangerous areas, and passageways. Personnel of formations working in water and sewer manholes and on gas networks wear isolating gas masks (frames 37, 38).

The military instructor dwells in greater detail on the second study question--the safety measures observed when conducting rescue operations on territory contaminated by radioactive substances. One such measure is to have the people work in shifts. The formations must work with a consideration for the permissible length of continuous work in protective resources. The time of work depends on the physical condition and training level of the people, the nature of the load and the temperature, and it may vary within broad limits.

The facility civil defense chief makes sure that formations are replaced at the required times.

In order to permit longer work, protective clothing is periodically moistened with water in hot weather, and moist protective overalls made of light cotton fabric are worn over rubberized overalls. Work areas within debris are sprayed with water to keep the dust down. Other safety measures include prohibition of the removal of protective resources, of work without protective sleeves, of drinking and smoking, and of eating on territory contaminated by radioactive substances.

During work, personnel are constantly subjected to dosimetric radiation control. After they leave a contaminated area, personnel undergo partial or complete personal cleansing, and their clothing, footwear and gear are decontaminated.

Competent narration coupled with broad use of training and visual aids, including filmstrips, will help the students to deeply assimilate the ways and means of rescue and emergency reconstruction operations and prepare them psychologically for actions in a complex situation.

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DOSAAF AND MILITARY COMMISSARIATS

YOUTH NAVAL TRAINING DESCRIBED

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) pp 34-35

[Article by Captain 2d Rank (Reserve) N. Badeyev: "What Should Young Seaman Clubs Be?"]

[Text] A slender, neat-looking officer entered the "Yunga" young seaman club of the Leningrad Palace of Pioneers.

"Senior Lieutenant Vladimir Rodionov!" he introduced himself to the children with a smile. "I am a navigator on a submarine of the Red Banner Northern Fleet. And it was here, some time ago, that I laid my first course in life...."

As a schoolchild he learned the ABC's of naval affairs in the club. He acquainted himself with the rules of navigation and underwent practical training aboard a training vessel. On this isle of romance of the sea, he came to love the glorious naval traditions with all of his young soul, and he made a firm decision to become an officer.

Many such meetings occur at "Yunga." Many of the club's former members have graduated from higher naval, marine and river schools, and now they are walking the decks of warships and vessels of the merchant marine and fishing fleet. And Vladimir Stasiloyts, who served in the fleet for a quarter of a century and who was retired into the reserves as a captain 2d rank, came to his old KYuM [Young Seaman Club] to transmit his great experience to a new generation of young seamen.

There are now more than 500 young seaman clubs in our country. They provide significant assistance to DOSAAF organizations training young people for work and military service on the oceans. Just the KYuMs of Moscow alone produce hundreds of well trained helmsmen, signalmen, engine mechanics and other specialists every year. To many, the seaman's profession has become a lifetime career. And in the naval and civil fleets, they master the complex equipment and get used to the difficult work of a seaman more quickly than others. Commanders and captains have good things to say about the graduates of the Novgorod, Irkutsk, Nikolayev, Vladivostok and many other clubs. They are disciplined and physically strong.

Great credit for this belongs to the defense society organizations in these oblasts, which provide highly qualified instructors to train the young seamen. Such is the case in Irkutsk, where on initiative of the DOSAAF committee of an aviation plant a seaman club for adolescents, the "Al'batros," was created. Under the guidance of their energetic and experienced chief , S. Sitnov, the children study naval affairs seriously and thoughtfully and they participate in the work of underwater navigation, marine competition and underwater orientation sections. During the time of its existence, "Al'batros" has trained almost 2,000 young seamen, half of whom submitted their applications for the navy.

The achievements of the KYuMs are obvious. But there are also many problems, upon the solution of which the success of their further activity depends. The most important is the gap between the training conditions ashore and on the water. Take as an example that same Leningrad "Yunga" club. Intense training proceeds here throughout all of winter in fabulously equipped offices. The children prepare eagerly for summer practical training, for a cruise aboard a training ship. But the club possesses only one small lake-river steamship which can take only 36 young seamen aboard. Three cruises are taken in the summer, meaning that 108 persons undergo practical training. But the club has a membership of about 500. Moreover the vessel itself does not satisfy the present requirements of young seaman training and indoctrination. It is not even equipped with a system to protect the aquatic environment from pollution. The club experiences considerable difficulties in the vessel's repair: They must rely entirely on the charity of their sponsors.

The KYuMs have the most diverse sorts of vessels at their disposal: Transporters, hydrographic vessels, pilots, trawlers, coast guard cutters, tugs and harbor craft. But alas, they have all seen better days, they have been written off, and their engines have served their full useful life. Of course the young seamen are grateful even for them. But imagine how much time, labor and nerves the club leaders and instructors must expend to push the repairs through and to find spare parts for the engines.

Many KYuM leaders believe that attention should be given to a proposal by N. Varukhin, chief of the Novgorod club, to draw up plans and begin construction of special training vessels for young seamen. The substantial assets spent every year to keep afloat the vessels which represent the yesteryears of our fleet are quite enough to build new ones outfitted with modern equipment. They must have compartments for specialized lessons and for a museum of combat glory, and a cabin for veterans of the Great Patriotic War: Because of the absence of the proper conditions today, they are rarely invited along on the cruises.

The interests of improving the training of young seamen demand decisive improvement of practical training aboard ship. But does every KYuM really have the resources to maintain its own training ship? Moreover some of the clubs are in cities nowhere near rivers or lakes. In the opinion of a number of the club instructors, flotillas servicing several clubs within a particular region should be created. The repair of ships in such a flotilla may be included in the plan of the nearest ship repair plant, and the ship should be given a ration of fuel and various forms of technical support.

Everything must be done to disseminate the experience of clubs that cooperate in marine practical training. As an example, last year on initiative of the DOSAAF organization, the Nikolayev KYuM invited a large group of graduates of the Tyumen' KYuM on a cruise on the Black Sea aboard the training ship "G. Sedov." The Siberians stood watches both while cruising and standing, and they acquired good practical habits of work aboard ship.

DOSAAF organizations of Moscow, the Ukraine and the Far East helped clubs establish strong ties with naval seamen and with the crews of vessels in the merchant marine. Owing to this, for example, Moscow's young seamen were able to participate in sea cruises on the Barents and Black seas and to learn from the experience of their elders.

But there are still many clubs which limit themselves to classroom training, citing the absence of a training ship. But they are forgetting an important means of preparing the children for the sea--rowboat and sailboat trips on rivers and lakes. The experience of the club in the city of Komsomol'sk-on-Amur attests to the fact that such trips are a fabulous form of testing the courage of the young seamen and that they satisfy the yearning of the children for adventure and independence. The club's former members systematically participate in long boat cruises on the Amur, and they have even crossed through the Tatar Strait. It is no surprise that this KYuM's students are distinguished by physical endurance and the ability to act confidently on water.

The second problem of the KYuMs is the lack of an integrated approach to training and indoctrination at a number of clubs. Some leaders feel that their duties are limited to just teaching the children the fundamentals of naval affairs and certain specialties encountered aboard ship. But the KYuMs are also schools of ideological development of adolescents. In them, young seamen develop high moral-combat qualities, a burning love for the motherland and the preparedness to defend it selflessly. The children leave the KYuMs for DOSAAF naval schools. This is why the committees of the defense society must devote the most persistent attention to raising the political preparedness of the young seamen.

Wherever military-patriotic indoctrination is well organized, the training is successful as well. Instructive experience in propaganda on combat traditions has been accumulated in the Moscow "Alyye Parusa" club, which was named after M. V. Kozhin--a party veteran, a participant of three revolutions and a political worker of the Northern Fleet.

The young seamen regularly meet with participants of the Great Patriotic War, and they participate in discussions on the heroic past of our people. Guests of the children have included delegates to the 26th CPSU Congress--Admiral V. V. Sidorov, commander of the Red Banner Pacific Fleet; Vice Admiral I. M. Kapitanets, commander of the Twice-Awarded Red Banner Baltic Fleet; Vice Admiral I. F. Alikov, and others. They described to the young seamen the tasks posed by the congress associated with strengthening the fighting power of the motherland, they encouraged them to study naval affairs even more persistently, and they invited the children to visit some warships. The admirals gave a high evaluation to the museum of combat glory created by the Moscow children.

Concern for the ideological indoctrination of adolescents bears its fruits: Former members of "Alyye Parusa" are the best students at DOSAAF naval schools. They enter higher naval schools, and they serve aboard various ships.

But cases of a different sort are encountered as well. Once I visited a training ship which returned from a cruise on lakes Ladoga and Onega and on rivers in the country's northwest. The young seamen spoke eagerly about channels and beacons, about the ocean depths and reefs, but they could say almost nothing about what sort of battles had been fought in the past war in the regions where they sailed. And yet they were in Petrozavodsk, they sailed by the island of Sukho, and they went by the region near Vidlitsa where the assault force was landed. The cruise leaders described the events of the war to the children in literally just a few words. The ship never dropped its anchor at places of former battles. But the ship was stopped more than enough times for swimming, to gather berries and to play volleyball.

The KYuMs have now joined the All-Union Exploratory Expedition "Chronicle of the Great Patriotic." The forthcoming cruises must be used extensively to gather materials on unknown heroes of the Great Patriotic War, relics and exhibits for the club museums. But on reviewing the plans of some KYuMs, one finds that adequate attention has not yet been devoted to this work: Places for visits with war participants have not been determined, the duration of halts in regions of former battles has been unjustifiably reduced, and plans have not been made to visit war memorials. Some cruise leaders are counting on help from museums of local history to gather relics for the club rooms of combat glory. But it is well known that only the personal participation of the children in the collection of the materials and of the written memoirs of war veterans would permit them to get a real feel for the heroic deeds of their elders. Every cruise must be a serious act of indoctrination, a lesson in courage and patriotism.

One final topic, which I would like to emphasize specially. I am referring to those who must direct the work of the KYuMs, show concern for them, and organize their activities in behalf of military-patriotic indoctrination of the growing generation. Unfortunately, total confusion reigns in this area at the moment. The KYuMs existing today are sponsored by a number of ministries. They are mostly within the jurisdiction of the USSR Ministry of Education, the USSR Ministry of Maritime Fleet and the RFSFR Ministry of River Fleet. Because the management of the clubs is so diffuse, their work is organized according to a common system. Absence of the appropriate study program makes it difficult to provide professional orientation to the training of the young seamen. The problem of finding indoctrinators and instructors for the KYuMs is acute. Some children wind up under the supervision of people who know of the navy only by rumor.

How could we let this happen? In my opinion the time has come for the USSR DOSAAF to take charge of the young seaman clubs. It has the experienced personnel, the good material base and the programs for basic naval training for adolescents. Incidentally, before the war the Society for Assistance to the Defense, Aviation and Chemical Construction of the USSR did all of the work with the KYuMs, and it proved itself worthy of this task.

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LECTURE ON AUTOMATIC WEAPONS MALFUNCTIONS

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[Article by Colonel K. Kolpakov: "So That an Automatic Rifle Would Work Faultlessly" (teaching recommendations for lessons 3, 4, 8 and 9 in subject 1 of the "Fire Training" section)]

[Text] Some military instructors, on glancing at the program, may shrug their shoulders in wonder: Why should students know the positions of the parts and mechanisms of an automatic rifle prior to loading, and the way they work during loading and discharge? Knowing how to quickly disassemble and assemble an AK rifle and shoot it accurately would be enough, they think.

But this is a mistaken and, all the more so, a damaging opinion!

What if something goes wrong, if the rifle jams? Only a knowledge of these questions would allow the individual to determine the cause of the malfunction without delay and to eliminate it quickly. Lessons 3 and 4 in subject 1 of fire training are very difficult, and they require maximum attention from the students. The first advice I would give to the military instructor is to do everything he can to make the lesson as visual as possible. In addition to training automatic rifles, an instructor going to the military training office should take along training cartridges, posters, filmstrips, a mock-up of the trigger release mechanism, or a large-scale homemade diagram of the positions of the parts and mechanisms of an AK rifle before loading. It would be suitable to disassemble one training rifle and keep the other whole. Before the lesson begins, the instructor should mandatorily determine whether or not the students have firmly assimilated the purpose and layout of individual parts and mechanisms of the AK rifle (using the assembled AK rifle), and especially of the moving parts (as we know, they went through this material in previous lessons). Those who cannot answer correctly should be given the homework assignment of going through all of the material again.

Before studying the positions of the parts and mechanisms prior to loading, the military instructor partially disassembles the AK rifle, and then puts it back together without attaching the gas cylinder and the magazine-opening cover. Holding this automatic rifle in his hands, the military instructor explains and shows that under the action of the return mechanism, the piston extension and gas piston take their extreme forward position (the gas piston is in the gas passage of the gas cylinder), and the bore is covered by the breech-block, which is rotated right about its longitudinal axis.

The cocking handle is used to pull the movable system a third of the way back, after which it is slowly released forward. The students can now see that after the breech-block is rotated right, its bolt camming lugs enter the slots in the breech--the breech-block is locked.

I recommend that the positions of the other parts and mechanisms prior to loading should be demonstrated in the same way. At the end of the lesson the military instructor can ask questions to determine how well the material covered was understood.

While studying the work of the parts and mechanisms during loading, the military instructor should turn his main attention to the main points of this process without wasting time on small details having no significance to an understanding of its essence. Moreover, rather than simply telling the whole story himself, he should include the students in the work by asking questions that would permit them to discover how the parts and mechanisms work on their own.

For example when demonstrating and explaining the action of the trigger release mechanism, the instructor must make it clear that the automatic tripping sear is used for firing in bursts. But when the automatic fire selector lever is set for single shot fire, after the piston extension and breech-block are drawn back the hammer engages the single-shot sear, and when the trigger is released it is caught by its shaped lugs which, when the trigger is squeezed again, slip off the sear notch, and a discharge occurs.

Now let us examine the methods of studying malfunctions occurring during fire and the ways of eliminating them (Lesson 9). This lesson will require, in addition to training automatic rifles, training cartridges and spent cartridges. The military instructor is advised to disassemble one AK rifle beforehand in order to explain the reasons of malfunctions. Note that this lesson would be effective only when the students firmly understand how the parts and mechanisms of an automatic rifle work during loading and firing. If a test shows that these questions are poorly assimilated, the instructor should dwell on them once again, and only after this should he proceed to the new material.

First of all the future soldiers must memorize that proper care of a weapon and its careful handling are a dependable guarantee of unpleasant surprises in combat. This is why the military instructor should state first of all that every student is obligated to keep his automatic rifle fully operable, strictly observe the rules of its storage, assembly and disassembly, cleaning and lubrication, inspection and preparation for fire, protect the weapon, and especially the barrel and trigger release mechanism, from blows and dirt during fire and movement, and be aware of the conditions under which the weapon is fired so as to prevent overheating of the barrel.

The principal way to correct a malfunction is to reload the automatic rifle. If this does not help, the problem should be sorted out, and then the cause behind the failure could be eliminated.

I suggest drawing up a table such as the one shown below as a means by which military instructors could achieve better memorization of possible malfunctions occurring during fire.

Type of Weapon	Malfunctions Arising: When Loading	When Firing	When Unloading
Automatic rifle, light machinegun	Cartridge feed failure, jammed cartridge	Misfire	Cartridge case extraction failure, cartridge jamming or ejection failure

To make the explanation more comprehensible, I advise deliberately causing one malfunction or another and then naming and describing it. Of course, the parts of the automatic rifle should not be broken or bent in this case. Perhaps another time the students could attentively examine the weapon and name the causes of the malfunctions themselves, without hints. The military instructor could correct those who make some sort of mistakes, or he could ask one of the friends of the person making the mistake to suggest the correction.

What causes malfunctions? Here are some of them, and the ways of demonstrating and correcting them.

Cartridge Feed Failure

Load the magazine with a few training rounds and attach it to the automatic rifle in such a way that it does not fit all the way into its extreme upper position and so that the catch does not engage with its stop lug. Hold the magazine in the left hand so that it does not fall out. Release the safety on the AK rifle with the right hand, and draw the cocking handle all the way back and release it. Now the weapon appears to be loaded and ready for fire. Squeeze the trigger. The weapon will not fire. Nor is the cartridge ejected after reloading. Ask the students to look in the chamber--there is no cartridge there. Consequently the reason for the malfunction is a cartridge feed failure, meaning that the rifleman must immediately see what is wrong with the magazine.

Cartridge Jamming

Attach the magazine to the automatic rifle. Rest the weapon on the table by its magazine bottom plate. Grasp the cocking handle with the right hand and draw it back a little. Take a training cartridge with the left hand and place it between the breech-block and barrel in such a way that the bullet end jams against the breech end of the barrel. Release the cocking handle. The rifle will jam as a result. In this case the moving parts will stop in mid-position.

Misfire

Load the automatic rifle. Squeeze the trigger. The weapon does not discharge. In this case the moving parts are in their far forward position, the cartridge is in the chamber and the hammer is lowered.

Cartridge Case Extraction Failure

Rest the automatic rifle against the table by its magazine bottom plate. Grasp the cocking handle with the right hand and draw it back far enough so that the front part of the breech-block has gone past the magazine. Take a cartridge case in the left hand and insert it into the chamber. Release the cocking handle; this will cause the breech-block to drive the next cartridge forward, and the bullet end of the latter will run into the base of the cartridge case.

Jamming or Failure of Cartridge Case Ejection

Rest the automatic rifle against the table by the magazine bottom plate with the magazine attached. Draw the cocking handle back a little with the right hand. Take a cartridge case with the left hand and insert it sideways (upside-down) in the breech forward of the breech-block. Smoothly lowering the piston extension, wedge the cartridge case between the front end of the breech-block and the front wall of the breech or the breech end of the barrel. The malfunction is obvious--a spent cartridge case is jammed, or it has not been ejected. In this case there is no cartridge in the chamber, and the moving parts have not reached their far forward position.

Malfunctions can also be created in the same way with a Kalashnikov light machinegun.

The order of cleaning and lubrication is studied in Lesson 9. Later on the obtained habits are improved in work with the automatic rifle. This lesson requires a training automatic rifle and its attachments, an assortment of cleaning and lubricating materials (a rag, oakum, KV-22 paper), light gun oil and a pack of wooden sticks.

First of all the military instructor should tell the students what cleaning and lubrication of an automatic rifle involves, and what the responsibilities of the detachment commander during this operation are. He shows the needed materials and tools, including sticks made locally from a hardwood tree. Some of them with flat tips can be used to clean and lubricate grooves; round sticks of varying diameter can be used to clean and lubricate holes, cavities, the chamber, the gas cylinder and the gas chamber. Pieces of rag cloth (oakum) are wound on these sticks.

The military instructor should explain the order in which the tools and materials are inspected, and the way they are prepared for work. The students should observe all of the procedures and then perform them themselves.

If no mistakes are made, the military instructor can demonstrate the order itself of cleaning and lubrication, turning special attention to cleaning the parts which are subjected to the action of powder gases during discharge (barrel, gas chamber, gas cylinder and hand guard, backsight bed groove, piston extension and gas piston, breech-block). The lesson should be concluded with a test on the material covered.

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LECTURE ON MINES

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[Article by Engineer-Colonel V. Knayz'kov, recommended for use in Lesson 1 of Subject 6, "Artificial Obstacles"]

[Text] To put it simply, let me say that mines should be looked at in a special way. There is good reason why combat engineers call them the "silent death." Covered with grass and dependably camouflaged--don't touch it and it won't touch you, but step on it or drive over it--it's all over in an instant.

Naturally, one or two mines won't make much of a difference. It makes better sense to use them against the enemy *en masse*. This is why special explosive obstacles or, more accuately, minefields are created in combat. They are intended to retard and, if possible, halt the enemy's advance.

Minefields are especially effective when the element of surprise is achieved. And, of course, if their use is tied in with the fire of subunits of different branches of troops, artillery primarily. After all, minefields force the enemy to linger within the zone of effective fire somewhat longer than usual. Moreover, self-propelled guns, armored transporters and infantry combat vehicles will inevitably expose their flanks when attempting to detour an obstacle, which is very advantageous to gunners, grenade throwers and antitank guided missile crews.

One important advantage of minefields is the simplicity, ease and swiftness with which they can be set up on a battlefield. As an example it is 50 times more productive to lay an obstacle consisting of TM-46 antitank mines than to dig an antitank ditch. Mines are easily conveyed by all forms of transportation--this makes it possible to maneuver minefields together with fire weapons in dynamic combined-arms combat.

The experience of the battle of Kursk, one of the greatest of the Great Patriotic War, shows that up to 1,000 mines were required for every fascist tank demolished on a previously created minefield. But when mines were laid in the course of combat, up to 100 mines were expended for every demolished tank.

All mines used in the Soviet Army are divided into antipersonnel, antitank, anti-assault landing and special-purpose.

The PMD-6 is a typical representative of the first type. This abbreviated name is decoded simply--antipersonnel mine, wooden. It is an automatic-action explosive unit of ammunition. A high explosive charge--a 200 gram TNT block and a fuse--is inserted into a rectangular wooden housing somewhat resembling a "pencil box." The "pencil box" is covered with a lid, which may be hinged. The overall dimensions of the mine are 200×90×45 mm, and it weighs 460 gm.

Now that the mine is assembled, the next thing to do is to lay it correctly. The most general recommendations boil down to the following: If it is used on bare ground, a hole of the right size must be dug out. Its depth is not eyeballed but determined in such a way that the laid mine would protrude about 1-2 cm above the ground surface and would be easily camouflaged to match the surrounding background.

But can mines be laid right on top of the ground? Of course, but this would require the appropriate conditions: brushwood thickets, dense and tall grass, crops and so on which would conceal the laid mines in the particular area. In winter, when the snow cover is up to 10 cm deep, the mine is laid on the ground. If the snow cover is thicker, first the snow is tamped down, and then the mine is placed on the tamped snow. It is concealed above with snow--a layer about 5 cm thick.

Now let us look at the text of the instructions: "When pressure is applied to the mine, its lid drops downward, pulling the safety pin from the fuse rod, which activates the fuse and explodes the mine."

Everything clear? Not quite. The whole question lies with how much pressure. Assume a gust of wind hurls a twig onto the lid of a laid mine or that a frog jumps onto it. Will the mine blow up from such pressure? No, the fuse will not be activated when the force exerted upon the lid is less than 1 kg. If it is within 1-12 kg, we can be assured that the mine will explode.

But the PMD-6 can knock out only one enemy soldier. Mines with fragmentation action, for example the POMZ-2, are much more effective in this regard. When it explodes, it can get several enemy soldiers at once, since its sure-kill radius is 4 meters, and the effective kill area is 48 m^2.

This mine has a cast iron housing with an open chamber beneath for the high explosive charge--a 75 gm borehole charge, and with a hole on top for the fuse. The body itself is serrated to produce a uniform fan of fragments when it explodes. The POMZ-2 is a tripwire mine. It is outfitted with the simplest possible equipment: a mine setting peg, a snap hook with a wire half a meter long and two pegs with a tripwire 8 meters long. The body of the POMZ-2 has a diameter of 60 mm and a height of 130 mm. A fully charged mine weighs 2.3 kg.

Let us follow a group of combat engineers given the job of creating a small minefield for training purposes. We turn our attention to the fact that there is no need to dig holes. The soldier takes the mine setting peg and pounds it into the dirt with several blows until the base of the mine body is 2-3 cm above the surface. Then he pounds the tripwire peg into the ground at a selected spot, secures the wire to it and stretches it toward the POMZ-2. He inserts the TNT block into the body, places the mine on the setting peg, screws the fuse into it, attaches the snap hook to the ring on the shear pin and immediately begins camouflaging the area.

There is one final operation to go. Before it, the combat engineer must make sure that the shear pin is in place and that it is secure within the fuse. Yes, everything is in order. Then, in one continuous motion, he pulls out the safety pin. The mine is ready for action.

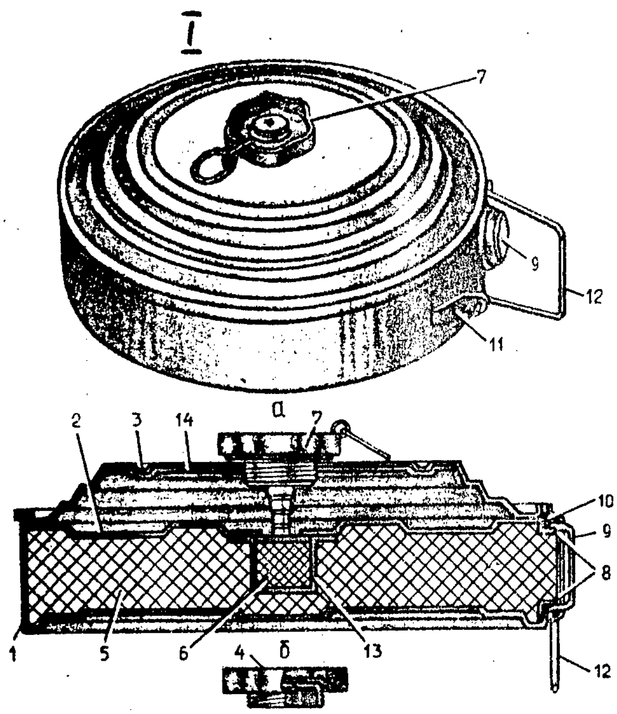

Figure 1. TM-46 Antitank Mine: a--external appearance; b--cross section; 1--body; 2--diaphragm, 3--lid, 4--plug, 5--high explosive charge, 6--intermediate detonators, 7--fuse, 8--neck, 9--cap, 10--gasket, 11--lug, 12--handle, 13--cylinder

The POMZ-2 can also be laid with a tripwire branching in two directions. This increases the probability that the mine would be tripped. All a foot soldier would have to do is snag the wire to stretch it and pull the shear pin out. The percussion needle heats the igniter set cap which detonates the TNT block. When the high explosive charge bursts, the body breaks up along the serrations into fragments, which fly apart radially.

Antitank mines are intended for use against tanks, self-propelled guns, armored transporters and other combat and transport vehicles. Let us acquaint ourselves with the TM-46 antitank mine. It contains a high explosive charge weighing 5.7 kg. Hot TNT is poured through a neck directly into a steel stamped body 30 cm in diameter and 9.6 cm high. The design foresees a diaphragm that separates the charge chamber from a pressure lid reinforced with a steel panel. There is a hole in the center of the pressure lid for the fuse.

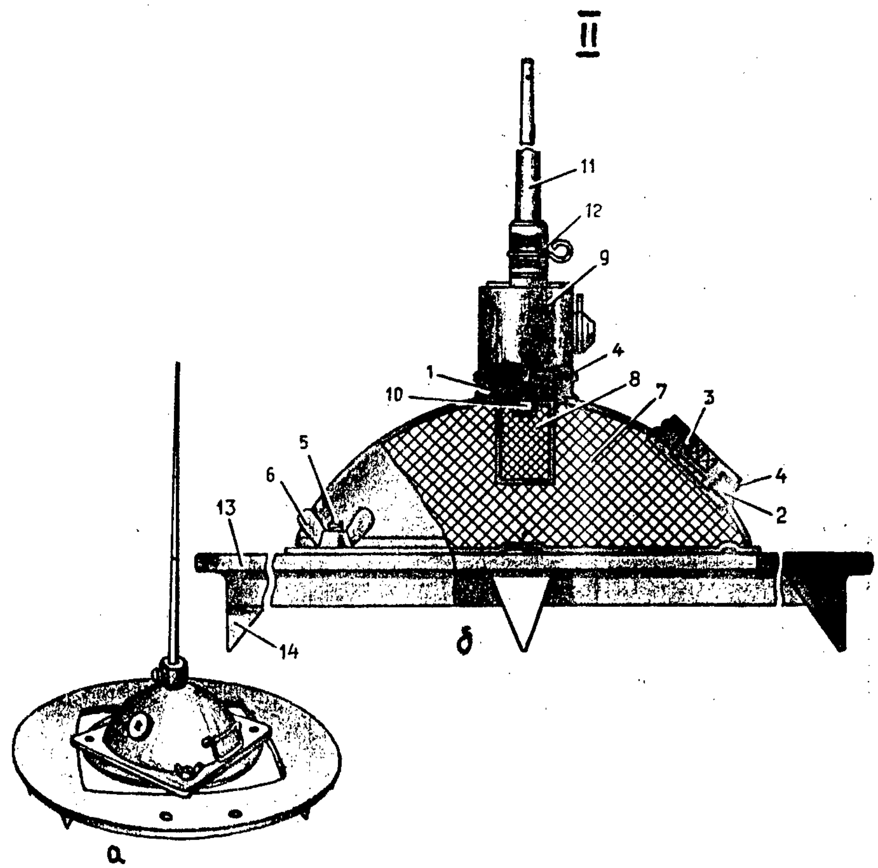

Figure 2. PDM-1m Mine: a--external appearance; b--cross section; 1--central neck and cylinder, 2--lateral neck, 3--plug, 4--leather gaskets, 5--bolt, 6--wing nut, 7--mine body with high explosive charge, 8--intermediate detonator, 9--fuse, 10--primer, 11--rod, 12--shear pin, 13--ballast plate, 14--spikes

To lay a TM-46, first a hole is dug, the safety pin is pulled out of the fuse, and then the mine is covered over with dirt and camouflaged. It will "bide its time" there until a weight of more than 100 kg comes to rest on it.

Combat engineers laying an antitank minefield observe one mandatory rule: The least distance between adjacent mines should be 4 meters. In such a case a tank would not slip by without insult.

Let us take ourselves mentally to the bank of a wide river. On it, a subunit of our troops is holding stubbornly to its defenses. The enemy has begun to cross, and his floating tanks and armored transporters are moving swiftly forward. Suddenly, to our surprise, an enormous watery column wells upward, settles back down, and over there, where there had just been a tank, boils a whirlpool of waves. And then another explosion, and another.... These were antiassault landing mines, which had been set beneath the water beforehand.

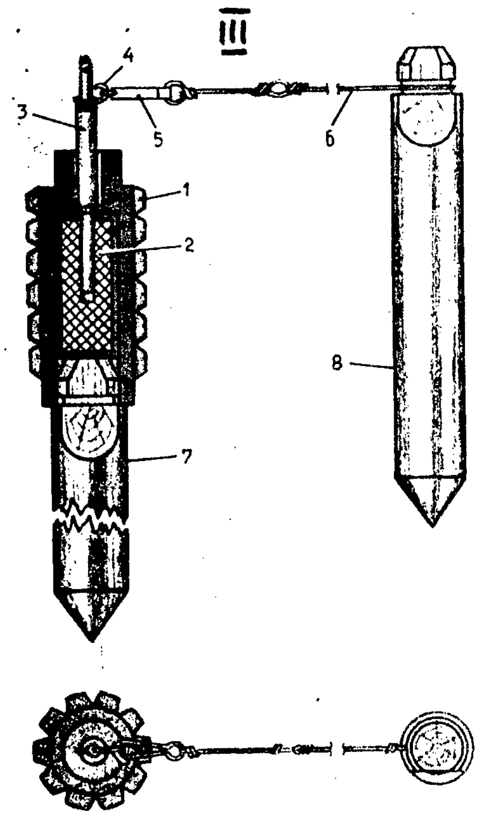

Figure 3. POMZ-2 Antipersonnel Mine: 1--body, 2--high explosive charge, 3--fuse, 4--P-shaped shear pin, 5--snap hook, 6--trip wire, 7--mine setting peg, 8--trip wire peg

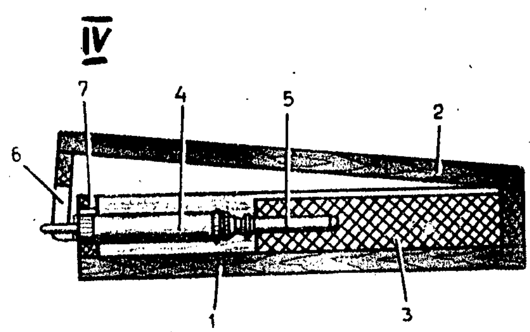

Figure 4. PMD-6 Antipersonnel Mine: 1--body, 2--lid, 3--high explosive charge, 4--fuse, 5--primer, 6--slot, 7--hole

If this is an antiassault landing mine, we would naturally assume that its design must be specific to its mission. Let us begin with the weight of the explosive. It is 10 kg in a PDM-1m mine--quite sufficient to open up the bottom of a floating tank or assault landing craft and quickly sink it.

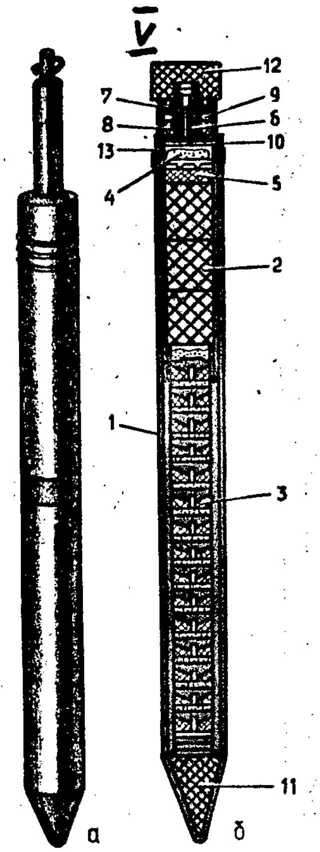

Figure 5. SM Signal Mine: a--general appearance; b--cross section; 1--body, 2--acoustic signal block, 3--light signal block, 4--powder charge, 5--firing composition, 6--nipple with igniter set cap, 7--nut, 8--rubber gasket, 9--rubber ring, 10--expansion ring, 11--inert filler, 12--plastic cap, 13--washer

Another tactical-technical characteristic we can note is the depth at which it is set. It varies from 1 to 2 meters, and the minimum distance between mines is up to 6 meters. Two soldiers take from 10 to 20 minutes to arm and set one mine.

There is another characteristic that is not altogether ordinary, but one that is mandatory to ammunition of this type. I am referring to the storm resistance of the mine--that is, its ability to withstand the force of waves without exploding "inappropriately." Specialists score the storm resistance of the PMD-1m as 6 points. That is not a bad indicator, if we consider that at such a sea state the height of the waves reaches several meters.

The mine consists of four basic parts--body, fuse, rod and ballast plate. The weight of a fully armed mine with a cast iron ballast plate reaches 60 kg, and together with its fuse and rod, it can be up to 1 meter tall. The PDM-1m has a safety device--an entire structural unit that is screwed into the body of the fuse to keep it from acting.

But when an antiassault landing mine is set, water necessarily seeps into the safety device through special holes and dissolves a sugar cube. Yes, I mean that in the literal sense, a simple chunk of sugar pressed into the body. In response to the action of a spring secured to it, the rod moves gradually forward, and after the sugar dissolves completely, it releases the fuse's striker mechanism. The time it takes for the sugar cube to dissolve is the time it takes for the fuse to go from its safe to its armed state. Of course, this time can vary depending mainly on water temperature: It is 8 minutes at +30°, while at zero or a little higher the process drags on for 2.5 hours.

Let us assume that the mine has finally been set and armed, and that a floating tank or landing vessel stumbles onto it. This unavoidably tilts the rod and, consequently, the fuse. As soon as the tilt angle reaches 10-15°, the striker is fully released. Under spring action it accelerates, heats the igniter set cap, which explodes to activate the intermediate detonator, which then immediately detonates the main charge of the mine. Do recall, that this is 10 kg of TNT!

Among mines laid by engineers, there are also special-purpose forms of ammunition. The most widely encountered type is the SM signal mine. How is it used?

Let us leave our watery defenses for a defensive line on land. What can we do to make sure that the enemy does not reach the disposition of our troops unnoticed? There are the most diverse ways and means at our disposal. The signal mine is a particular one. Its layout and use are extremely simple. But to an enemy attempting to reach our positions covertly at night, for example, it is a unique sort of trap.

If a person snags the thin tripwire, the SM operates. Moreover the designers foresaw double action for the mine. Imagine the effect when it operates: A group of enemy scouts are covertly making their way at night through bushes when suddenly the silence is pierced by a sharp sound signal lasting 8-10 seconds, followed by a flash of fire and hot signal stars flying out in all directions, rising to a height of more than 5 meters. The light signal lasts 10-12 seconds.

Such a mine has fulfilled its mission--the enemy was discovered promptly at maximum range. After all, the signal produced by an SM can be seen and heard for a distance of up to half a kilometer. And if this place had been registered in beforehand, the enemy could suffer a significant loss.

The weight of such a mine does not exceed 400 gm, its diameter is 25 mm, and its length is 320 mm. Its shape recalls a large pencil, like the one you see in souvenir shops.

We should note in conclusion that the mine examined here can be used at ambient temperatures from +50 to -50°. Soldiers must comply strictly with the requirements spelled out in the manuals and handbooks. Carelessness and imprecision in actions are impermissible. And if all of the rules are observed precisely and the mines are used competently, they become a dependable barrier in the way of the enemy's advance.

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DOSAAF AND MILITARY COMMISSARIATS

LECTURE ON UNDERWATER SUBMARINE RESCUE

Moscow VOYENNYYE ZNANIYA in Russian No 3, Mar 82 (signed to press 10 Feb 82) pp 44-45

[Article by Captain 1st Rank I. Kosikov, based on materials from the foreign press: "Rescue From Sunken Submarines"]

[Text] Efforts to develop and create new resources by which to rescue personnel from sunken submarines have become significantly more active abroad in recent years. This was motivated to a significant extent by the demise of the American atomic submarine "Thresher" in April 1963 with 129 seamen aboard. Peacetime losses of submarines compelled naval executives of the USA and other countries to initiate scientific research having the purpose of finding dependable means for ensuring the safety of the crews following serious accidents.

Three basic directions can be distinguished in the efforts to solve this problem: raising the viability of submarines and improving crew life support, improving existing and developing new resources for search, detection and identification of disasters; creation and improvement of the resources and methods of crew rescue.

Let us examine some of the resources and methods existing today for rescuing crews. They can be subdivided arbitrarily into three groups--individual, group and submersible search-and-rescue craft.

Individual resources include the rescue suit and breathing apparatus.

To allow the submariner to surface, rescue suits or, as they are otherwise called, diving suits, are supplied with a special inflatable vest, while some models have an inflatable hood. The hood is secured to the suit by a watertight fastener--a zipper, and it is filled with air from a safety vest intended to impart positive bouyancy. Any extra air that ends up in the hood when the submariner reaches the surface is removed through a special valve in its bottom part.

During tests on a diving suit with an inflatable hood in 1962 in England, 50 persons were taken out of the submarine "Tiptow," lying at a depth of 81 meters.

Use of the hood made it possible to solve two important problems: ensuring the submariner's safety by isolating his respiratory tract from the surrounding water, and creating conditions for him which would not impair natural and normal breathing during surfacing.

Further work was done on rescue gear in the mid-1960s in the laboratory and at sea. Laboratory experiments were conducted on people at depths of 180 meters in some cases. In June 1965 12 crewmembers were removed from the submarine "Orpheus" in the vicinity of the island of Malta. As a rule the diving suits are colored bright orange and equipped with electric lighting in order to facilitate the search for people floating on the surface.

In order to permit more dependable egress of personnel from submarines, the latter are supplied with special air lock devices and systems. For example England has developed an individual system permitting egress of the crew of a sunken submarine at depths of up to 150 meters. It consists of two air locks (at the bow and at the stern), a system providing air for breathing and special rescue suit (vest). The air lock fits one person, and it is supplied with an air reservoir, water purging and intake systems and a remote drive to open the upper hatch.

A submariner intending to leave the submarine via the air lock is connected by the valve on the left sleeve of his suit to the air reservoir, after which the lower hatch is closed and the air lock is filled with water.

As the air lock fills with water, a pumping system fills the suit with air. This air is stored in four tanks at a pressure of 280 kg/cm^2. By way of a regulator which decreases the pressure to 28 kg/cm^2, this air is fed to an automatic pressure regulator.

After pressure inside and outside the air lock is equalized, the air main automatically disconnects. With his vest and hood filled with air, the individual leaves through the upper hatch and surfaces at a rate of 2.6-2.7 meters/second (given a positive buoyancy of 27-31 kg).

Experiments established that a person needs an average of less than 3 minutes to abandon a sunken submarine: It takes 30 seconds to enter the rescue air lock, close the lower hatch and prepare the system, 30 seconds to flood the air lock (shaft) under normal pressure, 25 seconds to equalize inside and outside pressure, 4 seconds to open the upper hatch and emerge from the air lock, and 60 seconds to close the upper hatch and purge the air lock.

The air contained within the hood is used for breathing. Excess air is purged through a safety valve, which equalizes the pressure in the lungs and the environment. On surfacing, the individual slips the hood back, and the filled vest keeps him on the surface of the water.

This method of independent rescue of submariners from a sunken vessel has come to be called free surfacing egress.

The English rescue system described above has been adopted by the navies of several European countries. Thus submariners of the Norwegian and West German navies undergo training in submarine egress by this method each year.

Personnel aboard submarines of the West German navy also use another rescue device called the "Tauchretter," which includes a breathing apparatus and a rescue vest. Using it, a man can remain safely in a flooded compartment for 30-40 minutes.

New models of submarines are equipped with a system of air lines to which crew-member connect themselves. The gear of a West German submariner includes a personal radio transmitter to mark his location after surfacing.

In addition to individual protective resources, work is being done to create group rescue resources. These are capsules, sections or compartments into which the personnel move following an accident. Then they rise to the surface.

Thus for example, the FRG has developed a spherical 24-man capsule with a diameter of 2.1 meters. The capsule is secured to the top of the submarine's pressure hull in a special pit above a bulkhead. Two hatches on the bottom permit entry from neighboring compartments, and one upper hatch allows egress of people from the capsule after surfacing. After the capsule separates from the submarine, it rises to the surface independently, having a positive buoyancy of about 300 kg.

Such a system has also been patented by the French navy. Other plans are also being drawn for collective rescue resources. Thus the USA has patented a plan for a submarine with a separating nose section equipped with a propulsion unit, a control post and torpedo units. This system can be used when the main hull or the stern has been seriously damaged.

In the opinion of foreign experts, manned submersibles are the most promising rescue resources. There is a special program in the USA for developing deepsea resources, to include creating apparatus to detect sunken submarines and render assistance to the crews, developing equipment to raise sunken submarines from maximum depths, developing equipment to investigate the ocean floor and to find and raise small objects to the surface from a depth of up to 6,000 meters, and studying the possibilities divers have for withstanding depths of 180 meters and more.

The deepsea system for rescuing the crews of sunken submarines developed in accordance with the program described above has a special submersible as its basis. Its pressure hull is made up of three compartments joined together by access hatches. The fore compartment fits a crew of three, and the middle and aft compartments hold 24 rescuees. It can dock with the hatch of a submarine in distress when the latter is heeling up to 45°. Mechanical arms can be used to remove fragments from the coaming surface. The apparatus is 15.6 meters long, the compartment has a diameter of 2.4 meters, its underwater speed is 5 knots, and its maximum depth is 1,500 meters. The apparatus is supplied with vertical and horizontal scanning sonar stations, a depth sounding unit, hydrophone listening gear, light fixtures and portholes.

The apparatus is delivered to the trouble site on the deck of an atomic submarine or aboard special rescue vessels. C-141 transport aircraft are used when large distances must be covered quickly. As is noted in the foreign press, one such apparatus is capable of evacuating 144 persons within 14-17 hours.

Japan has developed a special submarine rescue system consisting of an air-cushion vessel and a submersible secured to the middle of the vessel's bottom. After the location of the submarine is accurately determined, the submersible is lowered. The latter docks with the submarine, takes part of the crew aboard and returns it to the vessel.

Self-powered craft intended to rescue personnel from sunken submarines have also been developed by other countries.

The NATO navies have conducted a number of exercises to practice the methods of crew rescue. A major exercise was conducted at the English base of (Fasleyn). English and Canadian "Oberon" class diesel submarines and an English-produced submersible (with a displacement of 14 tons and a submersible depth of 370 meters) took part in it. During the exercise the submersible sought out and approached a submarine on the bottom and performed ten docking-undocking operations.

Foreign specialists inform us that the success of a rescue operation depends on how precisely the location of a submarine in distress is fixed. Technical resources for detecting and marking the distress site are being created for this purpose.

As a rule these are distress buoys or a system of several buoys. The buoys separate from the hull of the submarine when it strikes the bottom, when it drops to a certain depth or when a dangerous trim is attained at the bow (stern).

Some buoys are supplied with radio transmitters, radar reflectors, flashing signal lamps and devices that form colored marker spots on the water and release shark repelling liquids.

Some submarines may be supplied with sonar beacons that are turned on when trouble occurs, making the search for them easier.

FIGURE CAPTIONS

Figure 1. p 45. General Appearance of the MK-4 Rescue Diving Suit.

Figure 2. p 45. Submariner in an MK-6 Rescue Diving Suit Prepared for Egress From Air Lock

Figure 3. p 45. Submarine With Separating Bow Compartment: 1--aft rudder, 2--main hull, 3--conning tower, 4--fore rudder afterpiece, 5--stabilizer, 6--fore hydroplane, 7--fore hydroplane afterpiece, 8--fore separating compartment; 9--central section, 10--aft section, 11--aft hydroplanes, 12--screw propeller.

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