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CONCEPT OF A MODULAR TRAINING COMPOUND

Abstract. The paper discusses a concept of a modern modular training compound (KOKOS) developed at OBRUM intended for training special forces and uniformed services (police, border guard, fire brigades). Standard ISO containers were used to build the training infrastructure, allowing for variable configuration of rooms. The training compound composed of functional modules is demountable and can be transported on public roads by transport means intended for moving containers. The paper presents several variants of setting up the compound. Mention is made of the versatility and modernizability of the solutions.

Keywords: operations in urban terrain, CQB training, MOUT training, container.

1. INTRODUCTION

Steel containers [1], [2] usually known as "large packages" for transporting various goods - from open containers (for transporting bulk materials or construction materials) to closed containers for carrying various goods (furniture, household appliances, electronics, textiles, etc.) have standardized dimensions and can be transported by road, rail, air and sea. The versatility of containers allows them to be used also in military technology, for instance to transport infrastructure of military bases, spare parts, ammunition, or for more advanced applications, such as mobile hospitals, field kitchens, repair workshops, or mobile training devices [3]. The use of container technology is particularly evident in NATO troops. The new emerging threats and the resulting armed conflicts force the creation, under field conditions and in a short time, of appropriate facilities for operational troops.

In the United States, containers for military use have been included in a separate standard document [4]. An example of a detailed solution of a facility assembled from transport containers and the necessary utility infrastructure is described in patent documents [5].

2. SPECIALIZED TRAINING

The recurring situations of life threats to civilians (armed robbery and hostage taking, terrorist attack, etc.), as well as participation in peacekeeping missions in conflict areas require the intervention of special services, special police units or even special forces of the armed forces. These activities require the participation of trained groups prepared for interventions, often in buildings, or in built-up and urban areas. Detachments or task groups must undergo specialized training to synchronize operations under the conditions of severe stress, often in limited space, using various techniques in various scenarios, including landing from transport vehicles.

The training compound designed (currently at the initial design stage) at OBRUM is intended for conducting, among others, exercises aimed at acquiring and improving mobility and operation of groups in buildings, including indoor spaces, stairwells. The training also includes basic elements such as forcing doors or windows (Fig. 1) of rooms often located at

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different levels, using different techniques of movement: using outside stairs, indoor stairs, ladders (Fig. 2), using ropes, or entering rooms through external openings and windows, e.g. by means of aerial landing from a helicopter.

Fig. 1. Exercises of task groups

The combination of dynamic exercises (movements) using specialized techniques and replicas or dummy firearms makes the exercises more comprehensive.

Fig. 2. Exercises in urban area
https://commons.wikimedia.org/wiki/File:B3_CQB_refresher_training.jpg

Thanks to the versatility, motoric habits are developed by initiating conditional reflexes in specific situations described in the implemented exercise scenarios. The solutions suggested are aimed at preparing a group/team for action in situations of threat to life and health of the members of the task force, conducting reconnaissance, rescue and anti-terrorist operations. The exercise scenarios are adapted to the user's needs which, with the high reconfigurability of the compound and a computerized exercise database, makes KOKOS a very versatile training device. The director/training instructor has the ability to program pyrotechnic agents (bang grenades, generating smoke in rooms) in different areas of the exercise, while viewing the reactions of the trainees using a system of cameras. Providing the system with a set of cameras (Fig. 3) for recording of the individual phases of the exercise/training course and of the behaviour of the trainees, and the possibility to replay the recorded scenes, allows the instructor to discuss the errors in the presence of the team. For this purpose, the compound is provided with an instruction room for the trainees. The completed training system may also include other specialized modules: director/instructor, operator, exercise repetition, weapons and auxiliary equipment store, etc. The dedicated power supply and control systems include protection against electric shock, lightning and short-circuit, and warrant compliance with high health and safety standards during the

training. The KOKOS training compound is a response to the actual needs reported by uniformed services, paramilitary organizations, civil defence forces, territorial defence forces with regard to improving the readiness and level of training of the services in situations of potential threats, including terrorist threats. Depending on the expectations and requirements of the end user, the modular training compound can be expanded and adapted, equipped for the needs of special forces. Specialized training conducted in the compound may include training in the field of CQB (Close Quarters Battle) [6] and, with an extended setup, also MOUT (Military Operations on Urban Terrain) [7], [8].

3. MODULAR TRAINING COMPOUND

The design of the training compound was focused on the development of an innovative trainer device construction at a relatively advantageous ratio of price to training possibilities. KOKOS is intended for a wide range of users, especially those of the uniformed services: Police, Prison Guard, Border Guard, Fire Brigades, Railway Protection Guard, or the Property Protection Agency, as well as for various types of armed forces, including special forces. The design concept was based on 40-feet High Cube 40 metal containers available on the Polish market [9].

Table 1. Container specifications

40'HC container - dimensions 40ft x 8ft x 9ft 6in (12.2m x 2.4m x 2.9m)					
Average internal dimensions			Average door dimensions		Average cubic capacity
Length	Width	Height	Width	Height	
12.015 m	2.345 m	2.69 m	2.335 m	2.58 m	76 m^3

The use of containers allows any configuration of the training system in both the horizontal (Fig. 3) and vertical (Fig. 5 - stacked arrangement of containers) planes.

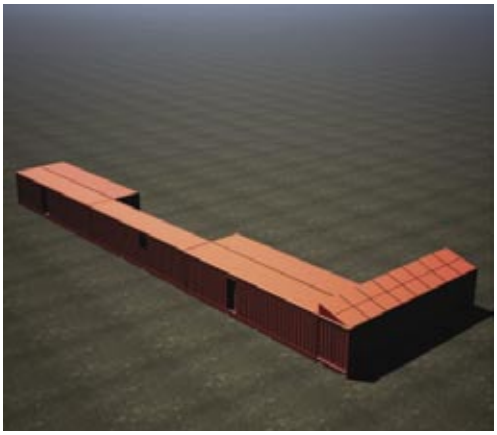

Fig. 3. Modular training compound (Option A)

The compound may include functional and task modules, including, but not limited to:

- task-oriented modules;
- instruction room;

- room for weapon use training;
- room for fire conducting training;
- storage room.

3.1. Task-oriented modules

Based on the 40 ft HC container, individual task and function modules will be designed to form a specific version of a training system.

3.1.1. Instructor module

The basic module is the "Command Module", in which the training instructor oversees the execution, monitoring and recording of the exercises (Fig. 4).

Fig. 4. Exercise monitoring and recording

This module will include: computer system for managing the course of the exercise and having an implemented database/library of exercises, direct communication system with trainers and external communications, automation and actuator control systems (lighting, smoke, thunderflash and bang grenades, door opening and locking, control of targets appearing - friend or foe characters in rooms, connection interfaces for cooperation with task/functional containers, including the main power supply control room. The station also has a scenario configurator with software for designing new configurations of task-oriented modules with observance of security rules and maximizing the use of equipment components of individual modules.

3.1.2. Task-oriented modules

Task-oriented modules are containers with equipment analogous to that of the real rooms. These containers have doors, windows, and furnishings (chair, sofa, table, etc.). The design of window and door openings allows for multiple assembly and disassembly of windows or doors that can be damaged during actions/exercises. Built-in camera systems allow for real time preview of the course of the exercise, trainee behaviour, recording and

subsequent playback. Appropriately designed and combined sets of several containers allow for the reconstruction of many rooms, corridors, entrance doors, etc. Control systems can block the opening of doors**.** Objects simulating an armed attacker or a neutral person may also be placed in the rooms.

In the case of compound shown in Fig. 5, a seven-container compound can be formed from the following example modules. In configuration of Fig. 5, the command and storage modules form a separate part of the training area, and due to the use of additional cabling, these can be set outside of the training compound.

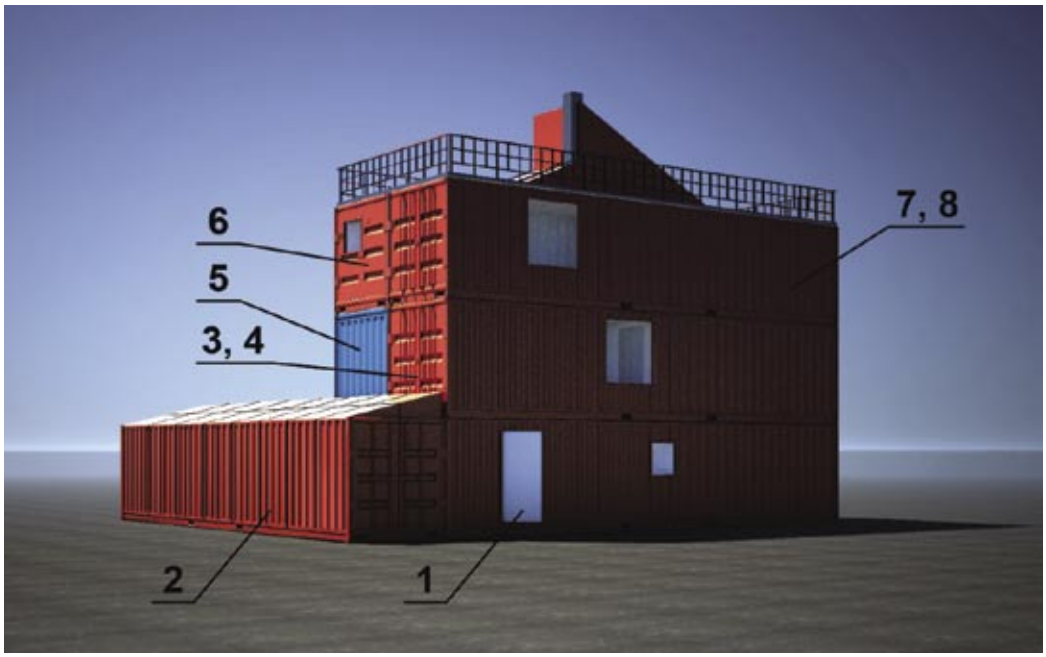

Fig. 5. Modular training compound (Option B)

1. **MD – command module**
2. **MM-ZS – power supply/distribution module and air conditioning system**
3. **MF 1 – communication module (corridor)**
4. **MF 2 – stairwell**
5. **MF 3 – transition room with three doors**
6. **MF 4 - room with armed terrorists;**
7. **MF 5 – room with hostages (civilians);**
8. **MF 6 – room - attic with roof exit;**
9. **MF 7 – room for any purpose (to be agreed with the client).**

3.2. Module – instruction room

This module is designed for conducting training to prepare multimedia-supported exercises (e-learning, interactive multimedia instructions). It is equipped with a projection system. It can also be used for discussing the course or repeating previously executed exercises and errors made.

3.3. Module – firing range with laser simulation

Training includes exercises in shooting and weapon use in situations presented by the multimedia system (airport, subway, railway station, government building, school, etc.), where armed attackers are among civilians or hostages are taken. A practical example of the application in the module may be solutions offered by manufacturers of a mobile container firing range [10] or video firing simulator [11].

3.4. Module – firing range for fire conducting training

The module is designed for instructing in conducting fire to stationary and mobile targets, including training for snipers both in virtual space using laser simulation, as well as training with live weapons (container firing range [10]). The module can be fitted with solutions used in the ŚNIEŻNIK device [12].

3.5. Module – storage room

This is a typical container for storing portable equipment of the training compound used for reconfiguration of the exercises. Optionally, an additional air conditioning system and/or a power generator can also be installed in the module.

4. SUMMARY

The implementation of a concept design in the industrial practice requires consultations and agreement with the future user. The applied technical solutions should be adapted to the objectives to be achieved by the trainee. Optimization of manufacturing costs of a training compound calls for maximum use of repeatable modules and structural units. For this purpose, at least several potential users should be consulted prior to the implementation of the technical design. In the end this could lead to a high versatility of the training system.

The KOKOS modular training system is a mobile means for specialized training that can be organized and conducted virtually anywhere. No permanent bonding to the ground makes it possible to set and use the system in any place: in built-up, urban area, in a parking lot, training grounds, etc., in accordance with the expectations and needs of the user/client. At the same time, as a structure not permanently bonded to the ground, there is no need for applying for any permits and for making arrangements required by the Construction Law. When the KOKOS compound is equipped with a power generator, its location (exercise site) becomes independent of the accessibility of the existing power grid.

The main features of the system, such as mobility, operational safety, scope of use and freedom of configuration, distinguish KOKOS from existing stationary training facilities with dedicated buildings and/or abandoned structures of a permanent urban infrastructure. The system enables adapting the configuration of the training compound to user needs, while maintaining rational and optimal costs.

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