

# THERMOBARIC OR ENHANCED EXPLOSIVES SYSTEMS

*Keywords: Thermobaric explosives, Enhanced explosives, detonation, air shock wave, confined space, shock wave-human body interaction, high lethality explosive systems*

The company **Explorom Special Services SRL** have opened together with a team of researchers a scientific and technological collaboration in order to develop new explosive systems, adapted for the new scenarios specific to the current military conflicts.

The new characteristic features of explosive systems are imposed by the need for efficiency and accuracy of the new weapons platforms that have appeared in theaters of operations: in airspace attack drones, in space aboard reactive grenades (PG-7) launched of grenade launchers (RPG-7).

**The need for research and development of new explosive systems is a constant in the activity of companies producing explosives, ammunition and weapons platforms.**

**TBX-thermobaric** explosives and **EHX-enhanced explosives** have been new solutions for equipping ammunition and explosive devices, used both by aerial weapons platforms, but also by land or sea platforms. . Examples are ammunition encoded with **TBX** or **EBX**. However, the specific features of explosive systems such as EBX or TBX are not always properly exploited, as their valences in their use under different environmental conditions are not known or recognized. For example, ammunition or an explosive device designated as a thermobaric cannot be used effectively when used in the open or in open ground.

The new scientific concept that underlies the research and development programs of **new thermobaric explosive systems (TBX)** and **high blast effect (EBX)** are **based on 3 goals or principles:**

1. The targets chosen for the new TBX or EBX explosive systems are living beings and slightly vulnerable material targets.
2. The effect of TBX or EBX explosive systems is explosive of the generation, propagation and transmission of shock waves in the environment surrounding the target (air or water - in case of underwater attacks).
3. The attacked targets are in confined or semi-confined space (in rooms, buildings, bunkers, tunnels, shelters, etc.)

The concept of developing thermobaric and high-blow explosive systems has its source in the knowledge and capitalization of the characteristics of shock waves in different generated with the detonation of thermobaric or high-blow explosive explosives.

Pressure pulses with amplitudes and pulses that depend on the type and quantity of explosives used, spread everywhere in space, making the probability of serious bodily injury and lethality close to 100%, making it unnecessary to use individual means of ballistic protection. , as can be done for the fragmentation effect. This can be designed by knowing the characteristics of the target, for example the geometric dimensions of the space / room in which the target / targets are located.

In this way, new explosive systems or ammunition can be designed, which can be designed and adapted by the user according to the vulnerability or characteristics of the target environment. For example, an explosive type with a charge of 1, 2 or 3 may be used that is additional and better responds to the operational requirements identified before the attack operation with explosive systems.

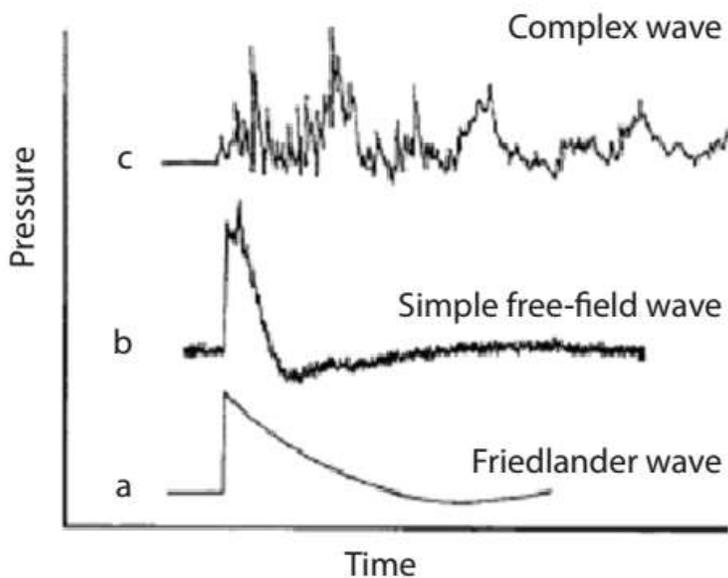


Image 1: Shock waves in the air induced by the detonation of explosives  
a-The ideal profile, b-outdoors, c-in confined spaces or in an urban environment

**New TBX or EBX explosive systems use the following principle or mechanism of action / operation:**

1. Under the action of a mechanically or electrically operated detonator the detonation of the explosive charge takes place, with or without the introduction of a specific delay, (of the order of milliseconds) depending on the type or nature of the target.
2. The detonation of the TBX or EBX explosive charge produces the generation of intense shock waves, with lower pressure peaks than in strong bristling explosives, but with similar pulses.
3. Dispersion of hot fuel particles, incomplete combustion products and formation of an aerosol with explosive properties.
4. Ignition of the explosive aerosol as a result of recombination with oxygen in the air.
5. Generation of additional pressure pulses, which overlap with the initial pulses generated by the detonation of explosives.

The overall consequence of the use of these thermobaric or high-explosive explosive systems is the realization of a pressure load, the amplitude of which is not too high (of the order of bars or tens of bars) but is higher than the limits for reaching lethality or serious damage to beings, human and material targets (see Table 1).

Pressure, kPa (psi)	Effects on Material	Pressure, kPa (psi)	Effects on Unprotected Person
0.69–34.47 (0.1–5)	Shatter single-strength glass	34.47 (5)	Slight chance of eardrum rupture
6.89–13.79 (1–2)	Crack plaster walls, shatter asbestos sheet, buckle steel sheet, failure of wood wall	103.42 (15)	50% chance of eardrum rupture
13.79–20.68 (2–3)	Crack cinder-block wall, crack concrete block wall	206.84–275.79 (30–40)	Slight chance of lung damage
13.79–55.16 (2–8)	Crack brick wall	551.58 (80)	50% chance of severe lung damage
34.47–68.95 (5–10)	Shatter car safety glass	689.48 (100)	Slight chance of death
		896.32–1,241.06 (130–180)	50% chance of death
		1,378.95–1,723.69 (200–250)	Death usual

Table 1 Effect of shock wave on material and human targets

Testing - the evaluation of these new explosive systems will be performed in configurations as close as possible to the real ones, or in scaling conditions, so as to know the parameters that successfully fulfill the mission of destroying material targets or neutralizing living personnel.

The experimental instrumentation will allow to obtain records in time and space of the pressure pulses generated or transmitted in the environment adjacent to the targets, based on which the qualitative and quantitative effect of lethality is evaluated (radius of destruction, neutralization, probability of lethality, etc.).

Examples of records can be seen in Figure 2.

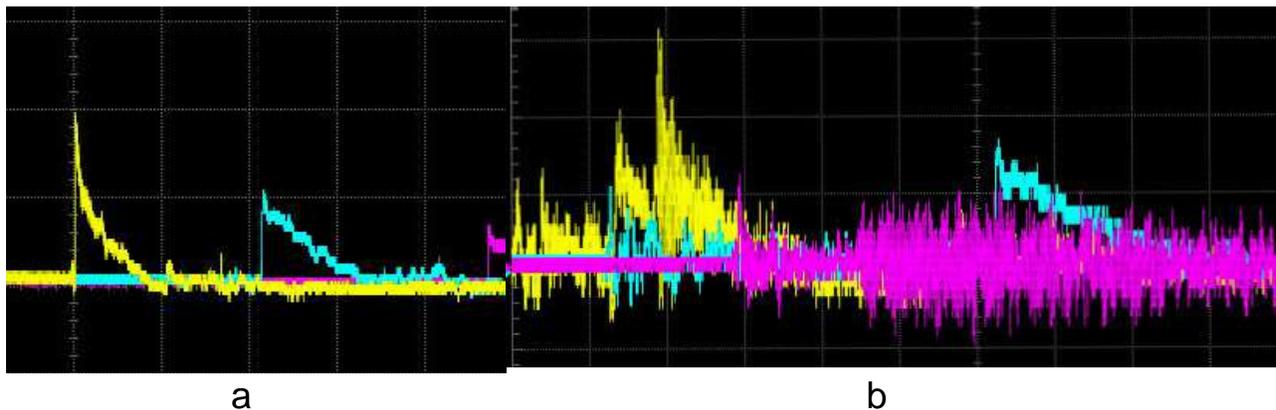


Figure 2 Shock wave recordings generated by detonation of explosive charges in confined space

- a. Shock wave in the air when an RDX-based explosive charge detonates
- b. Pressure pulses at the detonation of a TBX explosive system

The new concept of thermobaric explosive systems (TBX) or high blast effect (EBX) is intended for weapons platforms (terrestrial or aerial) with high impact accuracy, which can hit relatively small targets (of the order of m) and which may cause effects whose probability of lethality or destruction is 100%.

The concept can be applied with the definition by the beneficiary of the platform and the material targets, and the design and manufacture of the systems will ensure the desired lethality requirement, in the chosen real operational conditions.