

# Fuel-Air Explosives Mature

## First Used in Vietnam, Now in Chechnya, “Vacuum Bombs” Proliferate in Many Forms

by Captain Douglas Huber

More than 200 years ago, in 1785, a small city in Italy put itself on the map when a bakery storeroom exploded. This first recorded dust explosion occurred in Turin, not far from France’s border. What apparently happened was that flour dust filled a tiny storeroom and a lamp ignited the powder, causing the blast.

Since then, farmers and scientists have been studying these awesome explosions in an effort to learn how to stop them from happening. As farming became an industry, farmers needed to store more grain before sending it to market. As the size of grain storage facilities grew, so too did the explosions. One tragic modern example was the detonation of a grain storage silo in Westwood, Louisiana, which killed 36 and wounded nine more in 1977.<sup>1</sup> Scientists now label these explosions as “thermobaric” — a chemical reaction that produces extreme pressure and heat very rapidly.

Three things must be present for dust explosions to occur. There must be dust suspended in the air, oxygen present to support combustion, and a spark to initiate the explosion. As the grain particles get smaller, the explosion gets bigger due to the increased surface area.<sup>2</sup>

In the early 1960s, scientists began experimenting with this concept to produce a weapon that uses the same principle. But this time they were not using dust; they were using volatile gases and finely powdered explosives.

The concept of fuel-air explosives (what the Russians call “vacuum bombs”) is very simple. The two-part warhead first detonates, forming an aerosol cloud. The cloud is then ignited and the subsequent fireball sears the surrounding area while consuming the oxygen. This lack of oxygen creates an enormous overpressure, the primary means of destroying the personnel or

structures that this weapon targets. In less than a tenth of a second, the pressure within the explosion can reach 427 pounds per square inch. (Atmospheric pressure at sea level is a little less than 15 pounds per square inch.)<sup>3</sup> Personnel are literally crushed to death by the force. The Foreign Military Studies Office at Fort Leavenworth, Kansas, stated that fuel-air explosives “can have the effect of a tactical nuclear weapon without the residual radiation.”<sup>4</sup>

Bunkers, buildings, and other fortifications that are not hermetically sealed are subject to the lethal force of a fuel-

air explosive as well. The fuel-air mixture flows easily into these cavities and, when detonated, amplifies the destruction of the load-bearing components of the structure.<sup>5</sup> This type of blast can also be used to clear minefields, prepare and clear landing zones for helicopters, and as an herbicide, destroying crops and vegetation.

mobaric weapons, having created over 14 weapons to deliver these munitions. The first Russian fuel-air weapon was the RPO-A Shmel, or “Bumblebee.” Created in the late 1970s, it is a shoulder-fired infantry rocket flamethrower that gave soldiers the capability of engaging hard-to-reach spots such as mountains and populated areas. The Shmel delivers highly accurate fires and is versatile enough to engage several different types of targets.<sup>7</sup>

According to the Russian company that manufactures the Shmel, this launcher

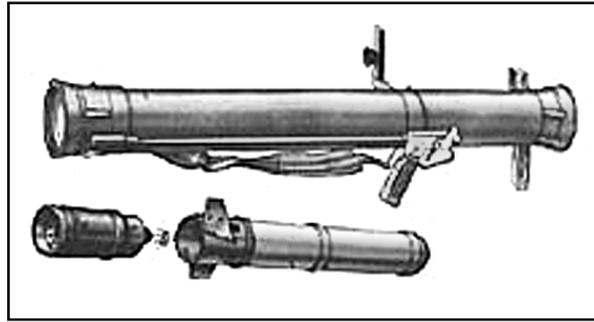


A thermobaric “dust explosion” killed 36 at this Louisiana grain elevator in 1977. Weapons designers have long attempted to exploit this effect in a host of controversial weapons that kill with fire and intense blast effects.

can deliver a 2.1-kilogram (4.6 pounds) shell containing a fuel-air explosive up to 1,000 meters. It is a 93mm tube that weighs a little over 23 pounds and can be fired from a standing, kneeling, or prone position.<sup>8</sup>

This weapon creates a fireball 50 meters in diameter that reaches temperatures of 2,500 degrees Fahrenheit. The

The United States first used fuel-air explosives in the 1960s in Vietnam to destroy Viet Cong tunnels and to clear forested areas for helicopter landing sites.<sup>6</sup> When the Soviets learned of fuel-air technology, they began developing their own weapons. Russia is now on their third generation of ther-



Russia's arsenal of over 14 types of fuel-air weapons range from the RPO-A Shmel shoulder-fired infantry rocket flamethrower, above, to the TOS-1 "Buratino," at left, a T-72 tank chassis with 30 220mm rockets in its launcher.

manufacturer of the Shmel, the KBP Instrument Design Bureau, compares the effect of the weapon to the destructive power of a 122mm or 152mm high-explosive fragmentation artillery round. In 1988, this weapon was used in Afghanistan with great success. Afghan rebels named it the 'Satan stick.'

According to *Jane's Infantry Weapons*, the Shmel can be equipped with a jet flame thrower, which shoots incendiary pellets that are scattered on impact. The other is a jet smoke projector that creates a smoke screen between 55 and 90 meters long.<sup>9</sup>

On the opposite end of the fuel-air weapon spectrum is the tank-like TOS-1, or Buratino ("Pinocchio"). Essentially a multiple rocket launcher, it is built on a T-72 chassis, and can carry 30 220mm rockets ready to fire. The rockets have a minimum range of 400 meters and a maximum effective range of 3.5 kilometers. This vehicle weighs 46 tons and has a cruising range of 550 kilometers. A crew of three mans the Buratino. The "zone of ensured destruction" is 200 meters by 400 meters. The Buratino is equipped with a laser rangefinder and a ballistic computer.<sup>10</sup> Russians first used this weapon in the early '80s in Afghanistan's Panjshir Valley during the Soviet-Afghan War. According to the manufacturer, the TOS-1 "is designed for defeating the enemy manpower on the open country and in defenses, as well as for lightly armored vehicles and transport."

Other Russian fuel-air weapons include:

- ODAB-500PM Bomb, a fuel-air-explosive-filled bomb
- KAB-500Kr-OD Bomb, a TV-guided fuel-air-explosive-filled bomb
- ODS-OD BLU dispenser, with ODS-OD BLU cluster bombs (8 per

dispenser). This cluster bomb dispenses fuel-air-explosive-filled bomblets.

- 300mm 12 tube rocket-launcher 9A52-2 (Smerch), a reactive-surround warhead on a 300mm rocket
- 220mm 16 tube rocket-launcher 9P140 (Uragan), a reactive-surround warhead on a 220mm rocket
- Shturm Antitank Guided Missile, a helicopter-mounted rocket with FAE warhead
- ATAKA Antitank Guided Missile, a helicopter-mounted rocket with FAE warhead
- S-8D (S-8DM) 80mm rocket, an aircraft-mounted rocket with FAE warhead
- S-13D 122mm rocket, an aircraft-mounted rocket with FAE warhead
- Kornet-E Long Range Antitank Guided Missile System, with thermobaric HE warhead, an infantry antitank rocket with FAE warhead.

These weapons entered the international spotlight when Russia began using them in the war with Chechnya. Several sources have reported that Russians used fuel-air explosives against Chechen rebels, especially in the capital, Grozny. Reports also indicate that these weapons have been very successful in helping the Russians defeat the Chechens.

On June 27, 2001, Reuters reported that Russian border guards used flame throwers against a group of rebels trapped in the Caucasus Mountains.

Vladimir Makarov, the border guards' deputy chief of staff, said high command had dispatched helicopter gunships carrying flame throwers to flatten and burn a piece of forest and remote huts where some 40 separatist guerrillas were hiding.

"We don't want to send our soldiers into battle to comb the area," Deputy Chief Makarov told state RTR television. "We don't want them to die. But once we have obliterated everything there with fire, they will go in to mop up." He stressed the effectiveness of flame throwers in attacks on people sheltering in buildings. "We have just struck two stone houses with flame throwers and nobody is firing back from them any more," he said. "I rate chances of staying alive after such strikes as very small."<sup>11</sup>

Top Russian officials have acknowledged that fuel-air explosives are very effective in destroying enemy soldiers in caves, tunnels, and mountainous areas.<sup>12</sup>

The Russians aren't the only ones that are using fuel-air explosives. While the British currently have no fuel-air weapons in their inventory, they are looking to develop a weapon that would be effective against bunkers and other fortifications.<sup>13</sup> According to an article in *Jane's Defense Weekly*, Britain's Defence Evaluation and Research Agency is looking to use fuel-air technology for this weapon.<sup>14</sup>

As noted, America has used fuel-air explosives in Vietnam to clear jungle foliage, destroy Viet Cong tunnels, and clear heavily-wooded sites for helicopter landing zones. According to the *Bulletin of the Atomic Scientists*, U.S. Army Special Operations used the "Big Blue 82" or "Daisy Cutter." Last used in Vietnam by U.S. Special Forces for clearing helicopter landing sites, this 15,000-pound bomb is filled with an aqueous mixture of ammonium nitrate, aluminum powder, and polystyrene soap. It can only be launched from a cargo aircraft, the MC-130 Hercules, by rolling it out the rear cargo door.<sup>15</sup>

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U.S. Central Command, those responsible for actions in the Middle East, admit that some fuel-air explosives were used during Desert Storm but will not say which ones.<sup>16</sup> The Naval Air Warfare Center states that the U.S. Marine Corps asked for fuel-air weapons to clear minefields, but the center never confirmed that these weapons were actually used in Desert Storm.

Fuel-air explosives have raised the ire of some human rights groups, among them Human Rights Watch. This organization, based in New York, seeks to “protect people from inhumane conduct in wartime.”<sup>17</sup> In February 2000, Human Rights Watch published a background paper on fuel-air explosives in which they condemn Russia for their use.

Their biggest complaint is that an army cannot control whom it kills when using fuel-air explosives. They also feel that these bombs are inhumane. In this paper, the Human Rights Watch sites a 1993 Defense Intelligence Agency report that describes the effects of a fuel-air explosive:

“Those near the ignition point are obliterated. Those at the fringe are likely to suffer many internal, and thus invisible injuries, including burst eardrums and crushed inner ear organs, severe concussions, ruptured lungs and internal organs, and possibly blindness.”<sup>18</sup>

Another Defense Intelligence Agency study suggests that the shock wave created by a fuel-air explosive would only cause minimal brain damage, leaving victims of this weapon to suffer for several seconds or minutes until they suffocate.<sup>19</sup>

The Campaign for Nuclear Disarmament is also opposed to fuel-air explosives, stating that these weapons “blur the distinction between low-yield nuclear weapons and conventional weaponry.”<sup>20</sup>

“Based on the Russians’ practices in the war in Chechnya so far, we have no faith that they will use fuel-air explosives responsibly,” said Joost Hilterman, a spokesman for Human Rights Watch. “Their use against populated areas would violate international norms on indiscriminate attacks.”

The Russians have proved that use of fuel-air explosives is both practical and effective in warfare. These weapons cre-

ate problems for both mounted and dismounted forces due to their wide coverage. As technology increases, these weapons will become more powerful and more lethal, drawing the attention of armies, politicians and human rights groups alike.

### Notes

<sup>1</sup>“Grain Dust Peril: Latest Grain Elevator Blast Renews Safety Concerns,” Manisha Parekh, *Industrial Fire World*, July/August 1998.

<sup>2</sup>Ibid.

<sup>3</sup>“A ‘Crushing’ Victory: Fuel-Air Explosives and Grozny 2000,” Lester W. Grau and Timothy Smith, Foreign Military Studies Office, Fort Leavenworth, Kansas, August 2000.

<sup>4</sup>Ibid.

<sup>5</sup>Ibid.

<sup>6</sup><http://www.wmd-nm.org/members/office/glossary/index.asp?where=f>

<sup>7</sup>*Jane’s Infantry Weapons, 26th Edition, 2000-2001*, Terry J. Gander, RPO-A Shmel rocket flame thrower, pp. 275-276.

<sup>8</sup><http://www.rusarm.ru/products/army/shmel.htm>

<sup>9</sup>*Jane’s Infantry Weapons*, pp. 275-276.

<sup>10</sup>“A ‘Crushing’ Victory: Fuel-Air Explosives and Grozny 2000.”

<sup>11</sup>“Russia Uses Flame Throwers on Rebels,” *Foreign Affairs*, June 27, 2001.

<sup>12</sup><http://www.hrw.org>

<sup>13</sup>Jane’s Europe News, “UK MoD Takes Explosive New Direction in Urban Warfare,” January 04, 2001.

<sup>14</sup>*Jane’s Defence Weekly*, “British Army Seeks Bunker-Buster,” Christopher F. Foss, January 17, 2001.

<sup>15</sup>*Bulletin of the Atomic Scientists*, Vol. 47. No. 4. “... And the Dirty Little Weapons,” Paul F. Walker, May 1991.

<sup>16</sup>Ibid.

<sup>17</sup><http://www.hrw.org>

<sup>18</sup>“Backgrounder on Russian Fuel-Air Explosives (‘Vacuum Bombs’),” *Human Rights Watch*, February 2000.

<sup>19</sup>Ibid.

<sup>20</sup><http://www.cnduk.org/briefing/thermo.htm>

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