



Review of Fire Extinguishing Devices

1. F.I.T. (Fire Interruption Technology)

F.I.T. – 5 (first version came out in 2007)

F.I.T. – Pro (improved version came out in 2009)



- F.I.T. is activated by direct heat of 518°F but it can also work like a grenade by pulling a pin and throwing it into a burning room where it explodes and disperses a non-toxic chemical mist. It consists of 2 chemical components – the oxidizer and organic fuel. When they react, they produce aerosol powder (potassium bicarbonate) that interrupts the fire chain reaction, by absorbing a lot of heat and producing a free radical that stops the fire sequence. The activation delay is 5-8 sec., and the time of aerosol discharge is 20 - 28 seconds.
- The device weighs around 5kg (10 lbs.) and contains 3.5kg (7.7 lbs.) of flame retardant. The motion of throwing it is compared to throwing a frisbee or a bowling ball. It is particularly useful when first responders fight a fire hotter than their protective equipment can handle. F.I.T. can fully extinguish a class B (fuel-based) fire in a room 2,100 cubic feet (60 cubic meters) or less and reduce fire temperatures from 1,000 to 300 °F (540 to 150 °C) in less than 10 seconds, and control class A (wood-based) fires enough so that firefighters can douse them with water. F.I.T. significantly reduces the amount of water needed to put out the fire, and the risk of great amounts of steam resulting from pouring vast amounts of cold water on the fire, is avoided. Another advantage is that it does not cause oxygen depletion in the room. The device is more effective when used early in a contained area, rather than in a free-burning fire.
- Potassium bicarbonate must be handled carefully; it can be dangerous if inhaled (by irritating the respiratory tract and causing coughing and shortness of breath) or swallowed, potentially damaging the gastrointestinal tract and causing nausea, vomiting and diarrhea. The odorless chemical can also severely irritate the eyes or skin if it comes in contact with either.
- ARA Safety (manufacturer) claims that numerous fire departments already use the device. Many insurance companies have reimbursed fire departments for the cost of the devices because they reduce fire and water damage. ARA Safety is exploring developing a larger version of the device and hopes to within the next year offer a fixed system for homes and businesses that could be mounted on a

wall or ceiling like a smoke detector and switched on when needed. The device is sold with a five-year warranty. If it is not deployed during that time, ARA Safety will replace it.

<https://www.youtube.com/watch?v=3L0OwSVk-xk>

<http://weisfiresafety.com/products/ara-fit-pro>

<https://www.fireapparatusmagazine.com/articles/print/volume-14/issue-4/features/some-chiefs-sold-on-fit-5s-fire-interruption-technology.html>

<https://www.scientificamerican.com/article/fire-interruption-technology/>

<https://www.fireengineering.com/articles/print/volume-161/issue-5/departments/technology-today/fire-interruption-technology.html>

<https://www.firerescue1.com/fire-products/suppression-equipment/articles/439069-Fire-suppressing-grenades-battle-flames/>

2. **Alternatives:**

- **Pyrogen Grenade**
 - introduces potassium radicals into the flame chain reaction without depleting oxygen. The aerosol gas has low toxicity. Zero pressure canisters, safe to transport and handle.

<http://www.pyrogen.com/Grenade.pdf>



- **Stat-X First Responder** - does not reduce the oxygen levels. weighs 1.5kg (3.3 lbs.) and contains 500 grams (1.1 lbs.) of a fire extinguishing agent that, when deployed, suppresses combustion and disrupts fire at the molecular level.

<https://statx.com/product/stat-x-first-responder/>



- **X-Tinguish FST** - emits a non-toxic aerosol mist that expands volumetrically, flooding the space and suppressing the flames within seconds, lowering temperatures by as much as 1,000 °F in less than 60 seconds. The device does not remove oxygen, has no pyrotechnic igniter, has a 15-year shelf life and a 5-year battery. The FST can save up to 80 percent in water usage and stop the burning of carcinogenic materials fast. It can eliminate flashover and backdraft.

<https://www.firehouse.com/operations-training/extinguishers/product/12353840/flame-guard-usa-llc-product-of-the-day-flame-guard-the-xtinguish-fst>



- **FR911 FLAMEOUT** - when the ampoule is thrown into the fire, an extinguishing agent is released into the atmosphere. The heat from the fire evaporates it and the chemical reaction releases certain amount of carbon dioxide that will suffocate the fire. The chemical reaction also releases a cooling agent and another chemical foams over the area to prevent the fire from smoldering and reigniting. Eco-friendly and non-toxic. CO² (4000ppm) and ammonia gas (20ppm) are produced.

<https://bonex-group.com/product/fr911-flameout-1200g/>

https://www.youtube.com/watch?time_continue=16&v=PcfWS5QVhY



- **Elide Fire Ball** - The ball will self-activate in 3-10 seconds after flame contact, bursting and spreading a dry chemical powder (non-toxic) automatically and make an alarm noise (less than 140 dB). Its operational active radius is a little over 4 ft. Extinguished fires types A, B, C, and E. The ball can be thrown at fire or mounted over risky areas.

https://www.youtube.com/watch?time_continue=96&v=SyGjUnJKbZk

<http://www.elidefire.com/about.htm>



3. Background and Early Fire Grenades

<https://99percentinvisible.org/article/stop-drop-roll-throw-fighting-fires-fire-grenades/>

- The earliest fire grenades were hand-blown, colored round glass bottles usually filled with salt water. These were designed to be thrown at a fire so the thin glass container would shatter and disperse the water to extinguish the flames.
- Later, fire grenades consisted of a cask of fire-extinguishing liquid and a pewter chamber loaded with gunpowder. A lit fuse ignited the powder and the resulting explosion would scatter the solution across a blaze.
- After 1900 fire grenades contained a blue- or reddish-colored liquid, carbon tetrachloride, also known as tetrachloromethane
- During the 1940s, scientists also learned that carbon tetrachloride was a probable carcinogen and when exposed to the fire's heat it can produce phosgene gas and fire grenades became less and less popular.

4. Future Considerations

- Aeronex Firefighting Drone: https://www.aeronex.com/eng/news/?text_id=10
- Flite Test Fire Fighting Drone: <https://www.flitetest.com/articles/fire-fighting-drone>
- Firefighting Robots: <http://wildfiretoday.com/2015/12/11/firefighting-robots/>
- Sonic Fire Extinguisher: <https://interestingengineering.com/two-engineering-students-invent-a-sonic-fire-extinguisher>

Other Extinguishing Methods

1. **NitroStrike** – Nitrogen Foam System that generates a durable bubble matrix that allows better adhesion to surfaces. The foam expands up to 40 times its volume to counteract oxygen and heat sources. It cools surfaces from 1200 to 127 degrees for 1 second, and any surface sprayed will not re-ignite. The product is safe for the environment and does not contain Freon or toxic chemicals. The foam is antibacterial and does not cause any health hazards upon contact, and it can be sprayed on people and pets for protection. The system allows the use of all foams, including decontamination solutions. It can blend foaming solutions in the manifold, without moving parts, which provides added durability.

https://www.youtube.com/watch?v=PaN_m726zsw

<https://www.youtube.com/watch?v=yO1YGBZWFAE>

<https://www.youtube.com/watch?v=ciuFmwtOU>

https://mydigitalpublication.com/display_article.php?id=481587

- **NitroStrike 2.5-gallon Portable Fire Suppression System**

- NFPA Rated 2A/10B
- 1 min. 45 sec. of sustained fire fighting/ decontamination at a 25' distance from your target
- low cost training solutions for exercises
- Conversion fitting required for compressed air use
- AFFF freeze protect solutions should be utilized when conditions are below freezing
- Dimensions: H:23.5 in x L 14.5 in. x W 8.5 in.
Weight: 20lbs (empty)/40lbs (full)
- Price: \$895

<https://www.narescue.com/fire-rescue-products/nitrostrike-2-5-gallon-portable-fire-suppression-system>



- **NitroStrike 30-gallon Portable Fire Suppression System**

- NFPA rated for 10A and 40B fires
- allows up to 5 min. of sustained fire fighting/decontamination at a distance of up to 75' from your target.
- easily adjustable system allows you to increase/decrease the water content of the foam solution to better tailor the foam consistency (wet or dry)
- narrow profile for doorway access or limited storage, large wheels to navigate uneven surfaces and a protective frame for tank security



- Conversion fitting required for compressed air use
- AFFF freeze protect solutions should be utilized when conditions are below freezing
- Dimensions: H:32 in x L 40 in. x W 27.5 in.
Weight: 330lbs (empty)/560lbs (full)
- Price: \$10,373
<https://www.narescue.com/fire-rescue-products/nitrostrike-30-gallon-portable-fire-suppression-system>

- **NitroStrike 60-gallon Portable Fire Suppression System**

- NFPA rated for 10A and 40B fires
- Twice the duration (10 minutes) with the same shooting distance (up to 75 ft), discharge rate of volume, operation and use as the 30-gallon unit
- equipped with caster wheels in front and flat free tires in rear to be pushed on flight lines, at airports, on warehouse floors, etc.
- Geared toward being mounted to the back of a truck, ATV, HUMVEE, etc.
- easily adjustable system allows you to increase/decrease the water content of the foam solution to better tailor the foam consistency (wet or dry)
- Conversion fitting required for compressed air use
- AFFF freeze protect solutions should be utilized when conditions are below freezing
- Dimensions: H:37 in x L 55 in. x W 34 in.
Weight: 500lbs (empty)/980lbs (full)
- Price: \$14,500
<https://www.narescue.com/fire-rescue-products/nitrostrike-60-gallon-portable-fire-suppression-system>

