How things could have turned out better for Mother Hubbard.

Sam Cohen: a radically different approach to nuclear power.

Journal of
Civil Defense
The American Civil Defense Association *Summer 1997 • $4.50*

Jarrell's Story.

Survivors of a killer tornado are picking up the pieces.

by Vickie M. Graham

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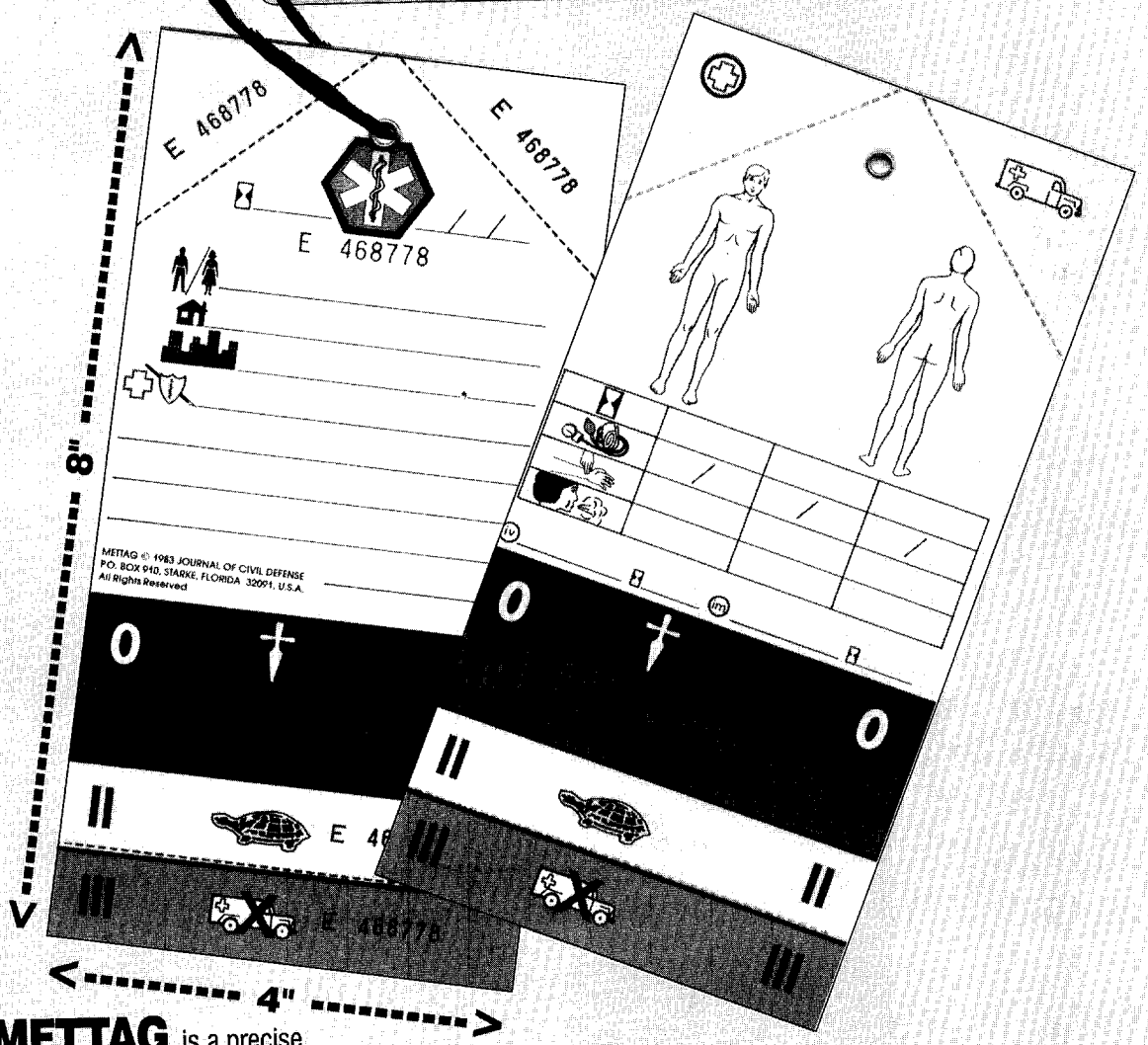

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Journal of Civil Defense
The American Civil Defense Association
Promoting sensible precautions for disasters.

Summer 1997

inside

To our readers...

"When I drove into Jarrell, everything looked calm.," reported **Vickie M. Graham** while researching this month's cover story. "Then I saw the Double Creek Estates subdivision — or where it used to be." Her story and photos, which begin on page 3, have lessons for anyone interested in disaster prevention.

Sam Cohen thinks some day nuclear power could be radically new and improved. Even better, judging from his story starting on page 12, you won't have to worry about glowing in the dark.

Ever open your cupboard only to find Mother Hubbard got there first? **James T. Stevens** says *forget them days*. But you have some work to do first, as his new column explains on page 10.

Need a 24-month food supply for two people? The **TACDA Store Catalog**, appearing on this issue's centerfold, can help you lay up food and other commodities for any number of people during disasters of almost any length. Heck, this stuff's so good (it says right here), you might want to dip in for Sunday brunch (we welcome any *feed*back). The nonprofit store's proceeds help TACDA promote sensible precautions for disasters.

If you've got the cash, you can install the **P-10 underground shelter** in about a day. Read all about it in "Re:Views," a new column on page 16.

The TACDA staff

A killer tornado hits central Texas.

Picking Up the Pieces in Jarrell.

by Vickie M. Graham, *page 3*

Stocking and enjoying an in-home grocery.

A new column
by James T. Stevens
page 10

Nuclear power, good and cheap.

But will it ever happen?
Sam Cohen makes you wish.
page 12

The *Journal of Civil Defense* is the official quarterly of The American Civil Defense Association (TACDA), P.O. Box 910, Starke, Fla. 32091; Kevin Briggs, president; Kathy Eiland, executive director. TACDA urges government and citizens alike to maintain sensible precautions for disasters — natural and man-made.

WashingtonPerspective

by Kevin Briggs

Lately, our country's civil defense efforts have focused on internal problems with the enactment of flood relief and domestic terrorism laws. This internal focus is reasonable given recent flooding and terrorism.

But what about *external* threats — especially from China and Russia?

Take China's development of the DF-31 road-mobile ICBM and the JL-2 submarine-launched ballistic missile. The DF-31 reportedly will be able to strike the United States by the year 2000. It will be hard to destroy because of its mobility and reputed ability to evade any future U.S. national missile defense *(Washington Times*, May 23).

The JL-2, with a range of more than 4,000 nautical miles, will also be able to reach the United States, even if launched near China. It reportedly will be deployed within 10 years (U.S. Navy's 1997 *Worldwide Submarine Challenges).*

The Chinese can already strike the United States with silo-based ICBMs and have threatened to use them if we interfere with their "One China" policy regarding Taiwan.

But oddly, the Clinton administration believes the Chinese threats don't warrant immediate deployment of a national missile defense. Why doesn't the administration acknowledge the *current* need for defenses?

It gets worse. A recent study by Richard Starr of the Hoover Institution noted that the Russian advanced weapons budget has gone from $2.1 billion in 1994 to $12.8 billion in 1997 — about a sixfold increase. A May 14 *Washington Times* article noted that Russian programs funded or in production include: (1) the M-2 mobile ICBM, (2) a tactical battlefield nuclear weapon system, (3) mini-nuclear weapons, and (4) seven Boreas-class submarines carrying the new D-31 sea launched ballistic missile.

And what about Russia's new nuclear bunkers and escape subways, including one under construction to Boris Yeltsen's dacha (reported in the April 1 *Washington Times)?* According to Pentagon spokesman Ken Bacon quoted in the *Times:*

"The Russians are building — and have been for some time — various underground facilities in Russia.... We do not regard the program as a threat. It is not an offensive program. It's a program to protect their officials. We don't understand why they're continuing to do this, but they are."

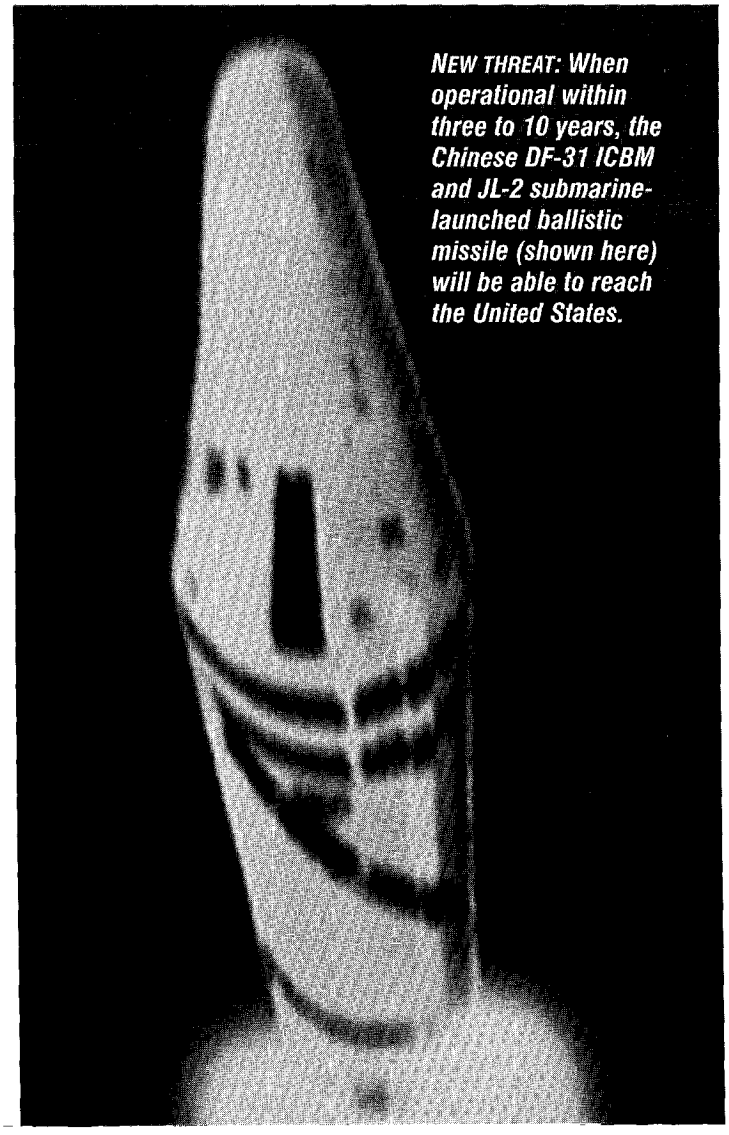
It's hard to understand how our government does not consider these programs a threat. Given the mounting evidence of Chinese and Russian capabilities, reasonable civil defense preparations are needed *now.* ■

Kevin Briggs *is president of The American Civil Defense Association.*

You can read an expanded version of this column at the Journal *web site: http://www.tacda.org/journal/*

Views expressed in this article are those of the author and do not reflect the official policy or position of the Department of Defense or U.S. government.

Based on U.S. Navy image



***NEW THREAT:** When operational within three to 10 years, the Chinese DF-31 ICBM and JL-2 submarine-launched ballistic missile (shown here) will be able to reach the United States.*

Journal of Civil Defense

Survivors of a killer tornado in Jarrell, Texas, are...

Picking Up the Pieces

Story and photos
by Vickie M. Graham

You can read an expanded version of this article at the Journal web site: http://www.tacda.org/journal/

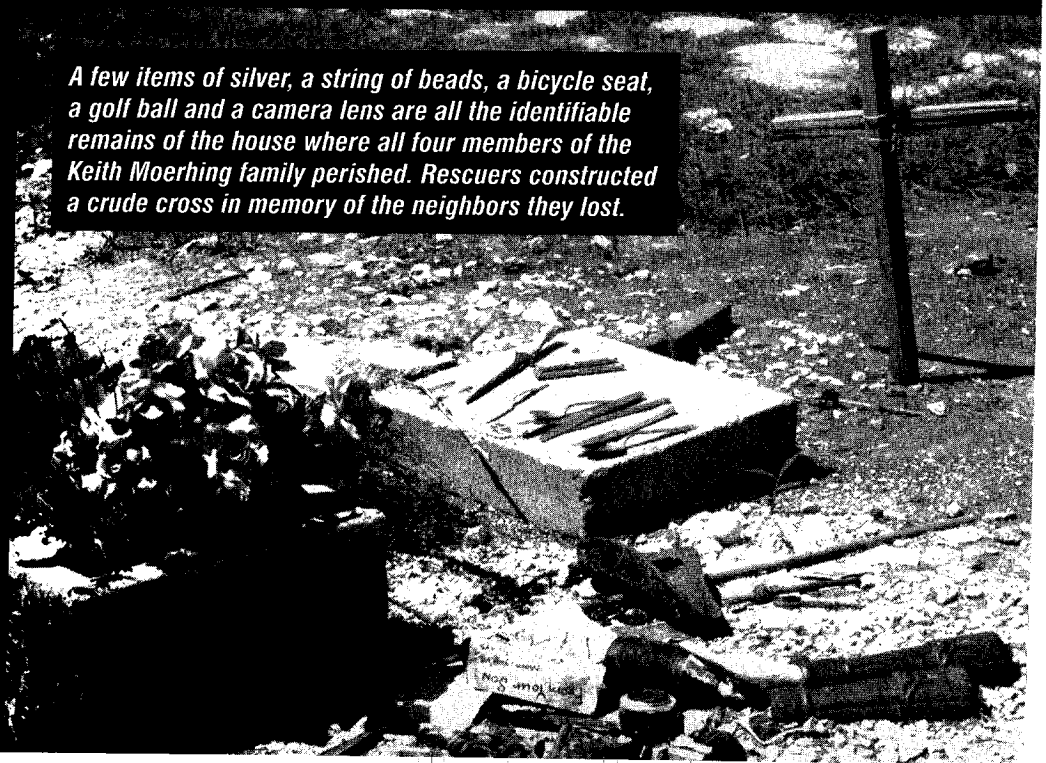
When a strong cold front from Canada collided with moist, tropical air from the Gulf of Mexico May 27, Mother Nature threw a colossal hissy-fit over central Texas.

At 3:22 p.m., the siren at the Jarrell volunteer fire department blared three times in an effort to warn the farming community of about 900 to take cover. Some heard it. Others didn't. And some thought it was just another call for volunteers to respond to an accident on I-35, which bisects the town some 40 miles north of Austin.

At 3:45 p.m., unleashing winds meteorologists later pegged at 270 mph, the unstable atmosphere spawned heavy rain, golf ball- to baseball-size hail and a half-mile-wide funnel cloud aimed directly at Jarrell's main residential and business district. Just before hitting the town proper, the fierce-looking funnel veered slightly west, touching down in a pasture of grazing long-horn cattle.

Moving at less than 20 mph, the eighth and deadliest tornado to strike Jarrell this century stayed on the ground an estimated 25 minutes, chewing up a seven-mile arc across Williamson County. The heaviest damage occurred on Jarrell's western edge, where the twister literally blew away all the houses, including some foundations, of the Double Creek Estates subdivision.

The tornado's toll in Jarrell: 27 dead — including four entire families — 20 injured, 37 homes destroyed and another 13 damaged beyond repair. More than 350 head of cattle, horses, sheep and goats also perished along with countless pets and wildlife. Officials estimate damage will top $30 million. *continued on page 4*



A few items of silver, a string of beads, a bicycle seat, a golf ball and a camera lens are all the identifiable remains of the house where all four members of the Keith Moerhing family perished. Rescuers constructed a crude cross in memory of the neighbors they lost.

Weather experts classified the tornado as an F5, the most intense category on the Fujita scale. (See box, "Wind Damage Scale.") Developed at the University of Chicago, the scale measures wind strength in terms of damage much like the Richter measures the strength of earthquakes.

Virginia Davidson, 43, was mowing her lawn as the tornado approached and didn't hear the warning siren. She first saw the funnel as she cut a wide circle on her riding lawn mower toward the house. It was hot and muggy and she wanted a drink of water. Instead, she grabbed her camera, stood on the front porch and clicked off a few shots before taking cover in her fiberglass bathtub.

"Everything started shaking, and I remember being dragged across the floor past where the walls were supposed to be," said Davidson, who'd covered herself with a blanket to protect her from flying debris. The tornado then pulled her and the tub into the air, slamming them back to Earth about 200 feet from where her 1,800-square-foot house once stood.

"I just kept repeating 'Oh my God! Oh my God!' I don't know how many times," the 22-year Jarrell resident told the *Journal of Civil Defense.* "I don't know how high up I was or how long because, frankly, I was too scared to want to know."

The tub shattered around her on impact, the largest recognizable piece about the size of a football. Davidson's worst injuries: a puncture wound to her left knee and deep bruises to her back and upper arms.

Davidson and her husband, Jim, who was at work when the tornado struck, are rebuilding on the same site and will probably add a new feature to their dwelling — a storm cellar.

As soon as the tornado passed, rescuers began the gruesome search for survivors. Among the first of Jarrell's 33-member volunteer fire department to arrive: Leslie Whitt, 26, the department's first-ever female volunteer. It was Whitt, a volunteer for just two weeks, who activated the siren upon receiving the warning from Williamson County emergency services officials.

> "I saw things I didn't want to see."

It was at the subdivsion Whitt received her baptism in rescue and recovery work. "The fire chief handed me a bunch of stakes and told me to stick 'em in the ground wherever I found a human remains," she said. "That's when I saw things I didn't want to see. Things too terrible to describe."

Wind Damage Scale

The **Fujita Wind Damage Scale** measures the strength of tornadoes by assessing the damage. Radar gives only an approximation of wind speed.

F1: Winds of 73 to 112 mph. Mobile homes are overturned, cars moved but not picked up, parts of roofs peeled off, but no major damage.

F2: Winds 113 to 157 mph. Roofs are torn off, mobile homes demolished, some trees uprooted.

F3: Winds 158 to 206 mph. Roofs and some walls torn away from frame construction homes. Trains are overturned, most trees uprooted and cars lifted off the ground.

F4: Winds 207 to 260 mph. Well-built houses are leveled. Structures with weak foundations are blown away, cars are tossed around and trees are ripped out of the ground.

F5: Winds 261 to 318 mph. Houses are carried away, pavement is uprooted. Automobile-size debris become missiles. Trees that are not sucked out of the ground are stripped of bark. There is a lack of debris in the path because almost everything is carried away. ***Source: National Weather Service.***

She returned to the fire hall for more equipment, but upon returning, state troopers and county police refused to let her into the area. "Even after I told them who I was and that I'd already seen the death and destruction, they wouldn't let me in. They let my husband in — he's also a volunteer firefighter — but kept me out. That really upset me. I was trying to do my job, and the cops wouldn't let me."

Also kept out of the area were friends, relatives and residents who wanted to begin salvaging their belongings to protect against potential looters.

"What they didn't understand — and I guess we could have communicated this better — was that there wasn't anything left to recover. Nothing!" said John Sneed, Williamson County's director of emergency medical services. "The human remains, dead animals, downed power lines and contaminated water posed a public health hazard, both physically and mentally. It looked like a bomb had exploded, and the subdivision was ground zero. I've been in this department 17 years, and I've seen some horrible things. But never anything like this. It shocked my senses."

The first priority: finding survivors and getting those who were injured to treatment. Next came recovering the remains of those who died, which was completed within the first 24 hours with help from thermal imaging cameras, portable lights, specially trained dogs and several shoulder-to-shoulder searches of the subdivision.

Two refrigerated trucks from Fort Hood served as a temporary morgue. County medical examiners were forced to use dental records and photographs to identify the dead.

Within an hour of activating the county's disaster plan, emergency and disaster relief crews from county, state and nonprofit agencies descended on the small town, causing a phenomena it had never experienced before: traffic gridlock.

More than 50 of Sneed's 70 emergency medical service employees responded to his call for help. Knowing there would be no place for relief crews to take refuge from inquiring media and townspeople, he ordered two air-conditioned buses to the area. Ultimately, they became debriefing centers where counselors, brought in from Lockhart, encouraged rescuers to talk about what they'd seen and experienced. "It's department policy never to counsel our own members," Sneed said. "That way, people feel much freer to open up about what they've been through. Using the buses for debriefings wasn't part of our plan, but it will be in the future."

He'll also include a laptop computer when responding to disasters of such magnitude. That way, he can send e-mail messages as another way of communicating and keep a running list of events as they occur.

The tornado knocked out power and phone lines in the area, which quickly jammed cell phone lines. Then, a lightning strike demolished the emergency services' radio antenna. "We couldn't communicate for about 45 minutes," Sneed said. "I don't know why, but the only phone line that worked was our emergency 911 service."

The Salvation Army and American Red Cross set up shop in the high school's cafeteria to handle the onslaught of donated food, water, clothing and furniture and help victims with immediate food and shelter.

continued on page 6

Above: *Kay Tucker sifts through photos at the Jarrell High School chemistry lab, where pictures, drivers licenses, credit cards, baseball cards and other items were taken to be claimed.*

Opposite: *Jim and Virginia Davidson stand on what used to be their front porch. The tornado blew away their house and its foundation. The Salvation Army is providing a mobile home free of charge while the couple rebuilds.*

News of the tragedy attracted national attention, and trailers loaded with goods arrived from as far away as Michigan and Washington. So overwhelming was the response that Jo Moss, communication director for the Texas Department of Emergency Management, issued a news release asking donors to turn contributions into cash because the community has no storage or warehouse facilities. With the combination cafeteria-gym stocked to its basketball rims, trucks dropped trailers filled with supplies next to the First Baptist Church, where people gathered to check a "safe list" to see who had survived.

"It was a good idea, but I think we should've taken only confirmed eyewitness reports concerning survivors," said Rev. Max Johnson, the church's pastor. "We initially listed one individual who died as a survivor based on a report passed through three people. It turned out the first person was confused about the time and actually saw the individual just *before* the storm hit, not after."

Communication is one thing Sneed wants to improve between state, county and city agencies responsible for emergency and disaster response. "Overall, it went better than I first thought," he said. "Each agency set up a command post of sorts and was doing what it was supposed to do. But there was little communication between agencies."

He'll work to correct that in the future, possibly through a series of meetings with various agencies to establish a combined command post.

Whitt agreed with the need for better communication. "GTE gave us the use of 25 radios for six weeks. But we need to get our own because we have just four radios for our 33 fire department volunteers," she said. "As for the fire siren, I've already submitted a grant to have weather sirens installed. They'll sound differently than our fire department siren so people will know a storm is approaching and take cover."

Not everyone sought shelter that day, however. Going against conventional wisdom, some fled the area as soon as the tornado warning was broadcast.

Although warnings were issued 40 minutes before it struck Jarrell, there is no way to know what a particular funnel is going to do and transmit that information in time, according to Jeff Kimpell, director of the National Severe Storms

Above: *Wanda Ickes, who was out of town when the tornado leveled her house, picks up food items donated by area grocers. Donations of food and clothing began arriving at the high school's makeshift shelter within two hours of the tragedy.*

Right: *John Sneed, Williamson County EMS director, had never experienced such huge devastation in his 17 years in emergency medical services. The lessons he learned will be incorporated into the county's revised disaster plan.*

Center in Norman, Okla. "The conventional wisdom to take cover in a bathtub, closet or interior hallway — given a well-constructed house — generally works. But in extremely severe tornadoes like this, nothing is guaranteed to work."

Douglas Smith, an assistant professor who studies disasters at Texas Tech University, underscored Kimpell's advice. "The probability of being involved in a tornado is about 1 percent," he said. "And the probability of an F5 tornado is even more remote. Only two have been reported in the United States in the last five years."

Of the 40 people killed during a tornado in Wichita Falls, Texas, a few years ago, 12 died trying to outrun it in their cars. Had they sought shelter, Smith believes, they would have survived.

"Powerful tornadoes usually move nearly three times faster than the one that hit Jarrell," he said. "In trying to outrun a tornado, you also risk a traffic jam or accident caused by panic. Since technology isn't at the point of being able to predict a tornado's strength or direction, the best advice when a warning is sounded is to take cover."

Many Jarrell residents already are looking at storm cellars and other options. Surveying the destruction some 44 hours after the tornado, they immediately understood why it was necessary to keep out everyone but recovery crews.

The area looked too much like the final scene from the movie "Twister." But there wasn't any music or credits at the end. The only thing left for survivors to do was start picking up the pieces. Of their homes. And their lives. ■

__Vickie M. Graham__ is a free-lance writer based in San Antonio.

About tornadoes

Tornado danger signs

■ Large hail: Tornadoes are spawned from powerful thunderstorms that produce large hail. Tornadoes frequently emerge from near the hail-producing portion of the storm.

■ Calm before the storm: Before a tornado hits, the wind may die down, and the air may become very still.

■ Cloud of debris: An approaching cloud of debris can accompany a tornado even if a funnel is not visible.

■ Funnel cloud: A visible rotating extension of the cloud base is a sign that a tornado may develop. A tornado is evident when one or more of the clouds turns greenish (a phenomenon caused by hail), and a dark funnel descends.

■ Roaring noise: The high winds of a tornado can cause a roar like the sound of a freight train.

■ Calm behind the storm: Tornadoes usually occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

When a tornado is coming...

...you have only a short time to make life-or-death decisions. Remember:

If at home:

■ Go at once to the lowest level of the building.

■ If there is no basement, go to an inner hallway or a smaller inner room without windows, such as a bathroom or closet.

■ Get away from the windows.

■ Go to the center of the room. Stay away from corners because they tend to attract debris.

■ Get under a piece of sturdy furniture and hold on to it.

■ Use arms to protect head and neck.

■ If in a mobile home, get out and find shelter elsewhere.

If at work or school:

■ Go to the basement or to an inside hallway at the lowest level.

■ Avoid places with wide-span roofs such as auditoriums, cafeterias, large hallways, or shopping malls.

■ Get under a piece of sturdy furniture such as a workbench or heavy table or desk and hold on to it.

■ Use arms to protect head and neck.

If in a car:

■ Never try to outdrive a tornado in a car or truck. Tornadoes can change direction quickly and can lift up a car or truck and toss it through the air.

■ Get out of the car immediately and take shelter in a nearby building. If there is no time to get indoors, get out of the car and lie in a ditch or low-lying area away from the vehicle. Be aware of the potential for flooding.

Tornado Watches and Warnings

■ A *tornado watch* is issued by the National Weather Service when weather conditions are such that tornadoes are likely to develop. This is the time to remind family members where the safest places in your home are located, and listen to the radio or television for further developments.

■ A *tornado warning* is issued when a tornado has been sighted or indicated by radar. The danger is very serious and everyone should go to a safe place, turn on a battery-operated radio, and wait for further instructions.

Source: Federal Emergency Management Agency.

TACDA Store Catalog

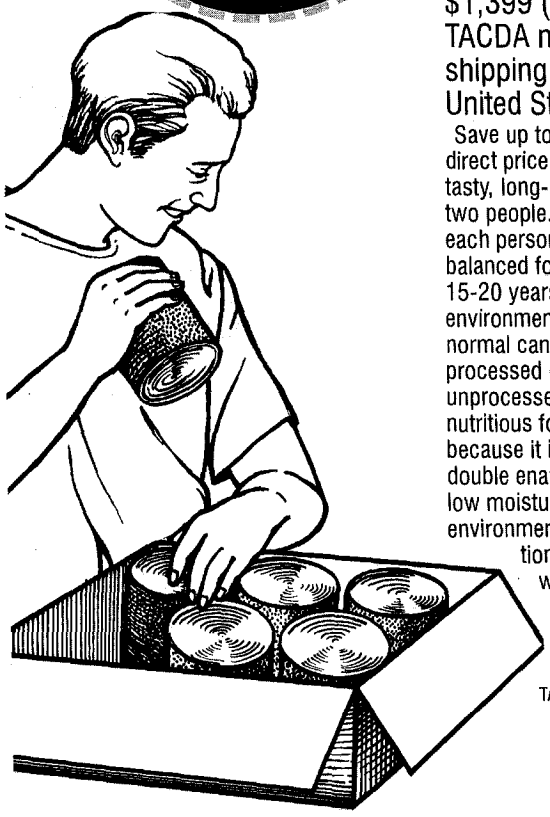
Special offers and fund-raisers

Offer 1

One-year food supply for two people (or two-year supply for one person). $1,399 (higher for non-TACDA members). Free shipping in the continental United States.

Save up to $400 off the factory-direct price on a one-year supply of tasty, long-storage-capable food for two people. For less than $2 a day, each person can eat nutritionally balanced foods that store well (up to 15-20 years if stored in a cool, dry environment — much longer than normal canned foods). Unlike processed canned food, this unprocessed food stays fresh and nutritious for numerous years because it is stored in heavy-duty, double enamel lined cans in a very low moisture, nitrogen laden environment. Comes with instructions and/or recipes — and when prepared, the food looks and tastes like it did originally (prior to the water being removed). Included in this one-year supply for two people are the following [note: numbers in brackets represent how many #10 size (~ gallon size) cans of each item are included]: fruit cocktail [1], applesauce [1], apple and banana slices [2], raisins [1], potato granules [1], corn [1], carrot dices [1], tomato powder [1], chopped onions [1], salt [1], nonfat milk [24], pinto beans [6], elbow macaroni [6], rice [6], whole wheat flour [12], hard red wheat [12], cracked wheat cereal [12], white sugar [6], peas [1], cabbage [1], bacon [1] / beef [3] / chicken [2] flavored TVP, fruit flavored gelatin [1], soup base [1], shortening [2], margarine [2], cheese [1], eggs [2], a sprouting kit with Alaska peas/ wheat/ lentils/ sprouting trays & cookbook, 32 lids for #10 cans and 3 lids for #2 cans (lids help maintain freshness after opening).

Recommended water storage for use with this food is 275 gallons.



TACDA Store illustrations by Pamela Thornbloom

Offer 2

Three-month food supply for one person. $340 (higher for non-TACDA members). Free shipping in continental United States.

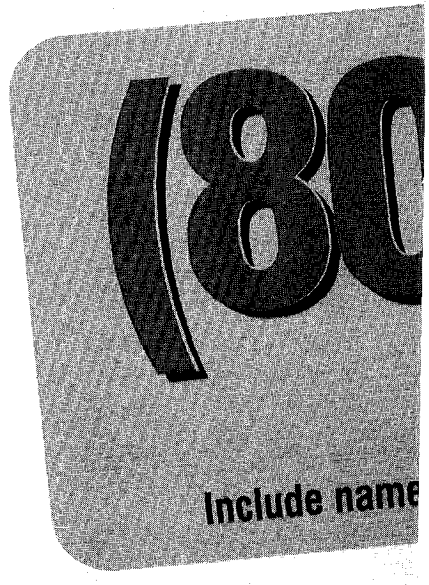
Save as much as $100 off the factory direct price (with shipping) on a three-month supply of food for one person. This unit yields more generous servings than Offer #1 on a per-day basis. It is stored in the same containers and can store well for 15-20 years. Included in this three-month supply is the following: #10 size (~ gallon size) cans: fruit cocktail [1], banana slices [1], egg solids [1], regular nonfat milk [3], potato dices [1], sweet corn [1], green peas [1], potato granules [1], cracked wheat cereal [1], chicken [1] / beef [1] flavored TVP, elbow macaroni [1], parboiled rice [1], split peas [1], margarine powder [1], #2 1/2 can size: beef soup base [1], tomato powder [1], bacon flavored TVP [1], chopped onions [1], no bake custard [1], cheese powder [1].

Recommended water storage: 55 gallons.

Offer 3

Only for TACDA members. 30 & 55 Gallon Water Barrels for only $48 and $67. Free shipping in continental United States.

Save with direct pricing. These are new, heavy-duty, food grade USDA-approved plastic barrels patterned after steel drums. These thick-walled units will never rust. Each barrel has two large filling openings (bungs) — one threaded with standard course NPT threads the other with a fine threaded bung stopper. Both are fitted with "O" ring seals.



Offer 4

Country Living Grain Mill. $312 (higher for non-TACDA members). Free shipping in continental United States.

Save as much as $70 off the direct price (with shipping) on what is perhaps the most popular, heavy duty hand operated grain mill in the country. This mill is made in the USA with high-carbon steel grinding plates (for finer flour than a stone grinder) and is easy to clean. The mill comes with industrial ball bearings which contribute to its 20 year warranty. It's unique flywheel has a V-shaped groove for adapting to an electric motor or exercise bike. It requires far less effort to grind grains than lesser quality mills. It grinds all grains into flour with adjustments ranging from fine to coarse grits.

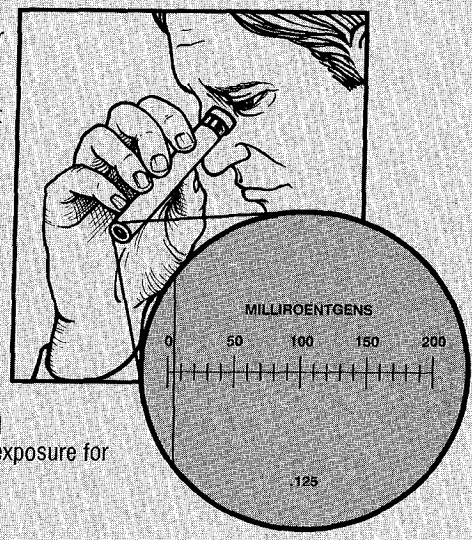
Offer 5

FEMA dosimeters. $120 (higher for non-TACDA members). Free shipping in continental United States.

Perfect for medical, scholastic, radiological emergencies, industry, and military applications

Receive lifetime free recharging on state-of-the-art FEMA dosimeters. These dosimeters satisfy military and ANSI requirements for shock, vibration, and immersion. They are direct-reading precision instruments about the size of a pocket fountain pen and measure accumulative doses or quantities of gamma and X-ray radiation. The low energy feature can be used in hospital applications including fluoroscopy, portable radiography and angiography and can monitor normal background radiation. A metal clip is used to attach the dosimeter to an individuals pocket or to any available object. A reading may be made at any time by merely looking at a source of light through the eyepiece end of the instrument. Dosimeters may be totally immersed in water without affecting the instrument readings. Before dosimeters can be used to measure radiation, they must be charged. This will be done prior to shipping but must be redone periodically (typically every year for the most sensitive models). TACDA would perform this recharging for free for the life of the instrument (other than for the necessary shipping and handling charges). Most all available dosimeter charging units may be used to charge these models. Because the dosimeter scale is linear, it is possible to determine the total amount of radiation exposure for any selected period of time. Dosimeters are accurate to within +/- 10% of true dose. Dosimeters can operate in temperature ranges of - 20 C to + 50 C and can operate up to altitudes of 50,000 feet and 90+% humidity. Models 742 and 746 would be perfect for fallout emergencies or possible dangerous short-term radiation exposures. Dosimeters come with a two-year limited warranty. Please order by model number.

Model (and range):
- 138 (0 - 200 mR)
- 138-S (0 - 2 mSv)
- 720 (0 - 2 R)
- 725 (0 - 5)
- 730 (0 - 20 R)
- 742 (0 - 200 R)
- 746 (0 - 600 R)



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The Prepared Pantry

A column about stocking and enjoying your own in-home grocery store.

Or: How things could have turned out better for Mother Hubbard.

By James T. Stevens
from *Family Preparedness Handbook*

Preparedness is expecting — and being ready for — the unexpected.

Family preparedness involves a proactive, self-sustaining lifestyle and a high level of readiness for circumstances beyond our control (see box, "No Control?").

Think of your home, apartment or other safe storage place as your personal in-home grocery store. That's right, a virtual personal shopping center, stocked with the things you need and like to eat—set up where you have unique access to it when needed!

Future columns will suggest guidelines for establishing your own in–home store:

- tools to help personalize your "in–home store" and provision it for dairy, bakery, produce, medications, personal care and meat departments, with additional storage for water and fuel
- guidelines for quantities and quality specifications, including listings of what foods, supplies and equipment to stock
- selected listings of suppliers for suggested storage items
- charts for listing, prioritizing and budgeting the orderly acquisition of supplies
- recipes for using your "in–home store" provisions

Basic in-home storage requires:

- sacrificing immediate gratification for long–term objectives
- setting aside time to establish and maintain a home storage program
- Purchasing adequate food and supplies.
- Designating and using living space for storage of food and supplies.
- Using stored foods as a regular part of daily food preparation.
- Rotating foodstuffs and supplies on a fixed schedule.

In future columns, we'll outline basic selections for family preparedness, ways to figure amounts, and elaborate on the 15 categories of food storage. Some of the categories are: finding and treating water, using whole-grain wheat, legumes and grains, making dairy products from powdered milk, sweeteners (honey and sugar), maintaining basic health with supplementation, sprouting and kitchen gardening, drying fruits and vegetables, and storage of energy and fuels. You'll learn how to be prepared for whatever emergencies may occur in your life. ■

Next issue: Getting started.

No control?

Consider this partial list of major disasters which occurred in the United States since 1983. Even the most responsible among us could not control these events:

Natural disasters

1983 — Forty-one states battered by icy winter storms of wind, freezing rain, and snow.

1989 — Charlotte, N.C., Charleston, S.C., and other inland areas devastated by Hurricane Hugo.

1989 — San Francisco bay area rocked by an earthquake during World Series playoff.

1991 — California residential areas suffered severe fire losses.

1992 — Southern Florida suffered worst damage ever from Hurricane Andrew as it destroyed public and private property.

1992 — Hawaii received vicious wind and water onslaughts and suffered heavy property damage due to Hurricane Iniki.

Basic in-home storage means using stored foods as a regular part of daily food preparation.

JCD illustration by Pamela Thornbloom

1993 — The Great Flood inundated eight million acres in nine states along the Mississippi River, causing $12 billion in damages.

1994 — January, several major calamitous situations faced by individuals and families in the United States, all happened concurrently:

- Los Angeles earthquake (6.8 on the Richter Scale), which disrupted the entire city, killed 60 people, and ultimately cost more than $6.5 billion.
- Twenty-four North Central, Midwest and Northeastern states were paralyzed by extremely cold and bitter winter weather by the "storm of the century."
- Natural gas explosion in Kentucky destroyed property and disrupted many communities.
- Frozen water distribution system in Atlanta, Georgia caused part of city to be without water for days.
- Extreme winter conditions disrupted businesses and federal government offices in many Eastern seaboard cities and towns, including Washington, D.C.

1994 — November, Hurricane Gordon ripped through southern Florida, destroying winter vegetable crops estimated in excess of $200 million, then proceeded up the Eastern shore to the Carolinas, causing additional losses.

There's little need to continue—the sheer volume of tropical storms and hurricanes during the summer of 1995 alone exhausted the entire alphabet!

Man-caused disasters

There are many instances of man-caused disasters—business management, political management, nuclear detonations, war, and terrorist acts:

1992 — Los Angeles barrios engulfed by civil riots and fires, looting, and vandalism.

1993 — World Trade Center bombed by terrorists, killing six people.

1995 — April, terrorist bombing of the Federal Building in Oklahoma City.

1995–1996 — continuing saga of elected officials straining to pass legislation on a balanced budget, which ultimately disrupted the lives and fiscal sanity of hundreds of thousands of federal employees during the Christmas season.

Have you noted the number of major airlines that have either been consumed or totally gone out of business?

Or have you witnessed the major changes among ***Fortune 500 companies***, closures of many military bases, and resulting major cutbacks in the military's civilian support industry?

Have you noticed how many ***Fortune 50*** (yes, that's fifty) companies have downsized their employment force by the tens of thousands?

Personal disasters

However, the most frequent disasters in our lives are the ones which don't get headline coverage—the private disasters which occur on a daily basis to people of all ages and incomes—some within our control and some outside our control. How many of the following personal disasters fall within your control?

- Serious illness or disability in the family
- Death of a family member
- Divorce
- Loss of home due to fire or flood
- Losses due to crime
- Loss of income or job due to rapid technological change, downsizing, or business closing
- Having less than two weeks income in savings
- Bankruptcy
- Isolation of the elderly
- Lack of income for retirement years
- Struggling to make ends meet
- Being technologically unskilled in a technological world
- Living impoverished in a world of plenty

After World War II, two efforts were undertaken to harness nuclear energy for peaceful purposes...

Can a new class of "safe" nuclear power reactors be developed that could overcome public fears and produce cost-effective power?

Controversial neutron bomb developer ***Sam Cohen*** *speaks out on this and other issues associated with debated neutron and red mercury questions.*

A new approach to nuclear *POW!*er

by Sam Cohen

...The first, which technically had been proven during the war, was based on fission of the heaviest atoms (e.g., enriched uranium) and worked out quite well in the United States until the radiobiological facts of life came into the foreground, with such unpleasantries as Three Mile Island, Chernobyl and radioactive waste disposal, which sharply limited a previous glowing potential.

The second, which to many scientists was little more than a fanciful dream, was pure-fusion energy based on the "ignition" of the very lightest atoms — primarily the two heavy forms of hydrogen: deuterium and tritium.

As for the second, the major efforts so far, after the expenditure of tens of billions of dollars involving fusion reactor facilities comparable in size to a basketball court, up until very recently have not succeeded. Even some of the most wide-eyed optimists have come to doubt whether it will materialize during their lifetime, or even their children's. However, when this great day comes, so say the proponents, cheap, clean nuclear power will be at hand, unencumbered by the spectre of reactor meltdown and blowup, and widespread, long-lived radioactive contamination.

On a vastly lower scale of effort and cost, however, have been attempts, going back decades, to use high explosive energy to compress and heat heavy hydrogen to a degree where, as in a neutron or hydrogen bomb, it burns of its own accord. These attempts took place along two lines, both of which appear to have been started by the Russians.

One was the use of a rather massive amount of high explosives, on the order of 1,000 pounds, in spherical form, imploding a series of concentric metallic shells, to in turn implode upon a central, very small capsule containing roughly the same amounts of deuterium and tritium. This program began under the direction of nuclear weapons designer L.A.

Artsimovich and under the aegis of Andre Sakharov, the Soviet father of the H-bomb and later a high priest of nuclear disarmament for which he received the Nobel Peace Prize.

In 1957, Artsimovich presented a paper at Geneva during a conference on the Peaceful Uses of Atomic Energy. He was politically limited in his technical reporting but he did claim that neutrons resulting from deuterium-tritium reactions could be produced with "absolute reliability and reproducibility" and were not appreciably slowed down in passing through warhead material. He was describing the elements of a mini-yield, in the ton range, neutron bomb.

This was the last open report from the USSR on this research. However, a few years later a Red Army colonel wrote in the prestigious military journal *Red Star* an article apparently based on Artsimovich's work, entitled "On Plans for the Neutron Bomb." The colonel's technical accounting was flawless. Around the time of Col. Pavlov's article the United States had made similar calculations which were classified at the secret level and which essentially matched those of Pavlov. The U.S. calculations stemmed from a highly classified project going on at the Livermore laboratory in Northern California which was in essence the same as Artsimovich's. The U.S. project eventually came to a halt because of certain technical difficulties. It is not known what eventually happened to the Soviet program, which very well might have succeeded.

Another such line of attack was based on exploiting high explosive energy and involved the magnetic confinement and compression of a deuterium-tritium plasma (a heavily ionized gas). This system is poised to produce what, in effect, would be a series of mini-neutron bomb explosions which would be contained and the energy tapped to provide electric power. The devices based on this principle which have been tested thus far do not offer any serious competition with conventional fuels into the forseeable future. The major drawback at present is that they are far from cheap, probably costing in excess of $100,000 and the nuclear yield far too small to be of any value. Unlike a nuclear reactor, fission or fusion, this device destroys itself in the process of producing energy, putting its cost effectiveness into serious question.

At present, the only known significant effort on high explosive magnetic compression involves a U.S.-Russian collaboration which has been going on over the past several years. The project, based considerably more on Russian rather than U.S. scientific expertise, has taken place under the aegis of the Los Alamos laboratory and its Russian equivalent, Arzamas 16, and uses some of the best nuclear explosive designers available. Considering that but a decade ago such a collaboration would have been veritably (i.e., politically) impossible, this program has been highly and widely publicized as an example of the remarkable progress that has been made on nuclear cooperation between the two countries.

The present devices being tested are relatively bulky — cylindrical in geometry, having diameters ranging from 1½ to 2 feet and approximately 6 feet long, this volume containing some 100 pounds of high explosive. Add to this the necessity for huge, truck-size electrical capacitors.

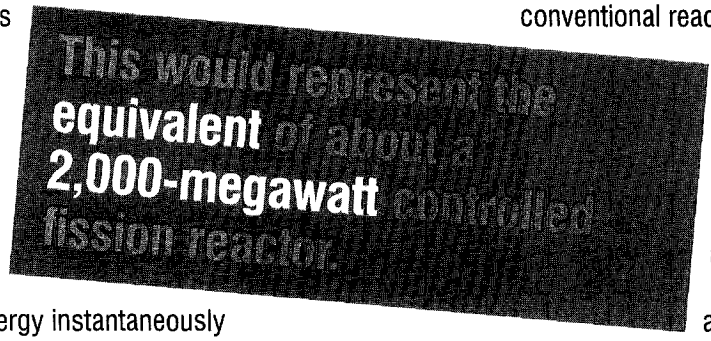
If the future of magnetic compression to produce nuclear power seems questionable, at the same time, at least in the United States, the future of nuclear fission power reactors does not seem very promising, primarily for political reasons. In this context, there may be an in-between solution using both kinds of reactions that may, to a significant degree, overcome political resistance to a degree where cost-effective power may be at hand. Affecting this issue in a major way will be, of course, the future costs of conventional fuels. (To this point, one might recall the oil embargo against the U.S. resulting from the Yom-Kippur war of 1973 in the Middle East. Before the embargo there had been an initiative in California to bar construction of fission power reactors, primarily due to the fear of radioactive contamination. At the beginning, polls showed the initiative would pass overwhelmingly. Then came the embargo, and on election day the initiative was overwhelmingly defeated.) Specifically, what is being advanced here is a concept radically different from those dependent on a large scale fusion explosion (i.e., tens of kilotons) or multi-thousand mega watt fission reactors. The difference is that the energy generated comes essentially from the sustained fission of non-reactor grade uranium — namely, U-238 — which is made possible by detonating pure-fusion devices within a shell of uranium oxide, an extremely cheap material that can be mined or produced by using the "depleted" uranium left over from the production of enriched, reactor grade, uranium. Without going into engineering details, which as of now probably are nonexistent, the basic scheme would be to have pipes running through the heated fuel, giving rise to steam to drive a turbogenerator, as is the case for conventional fission power reactors.

What is being advanced here is a concept radically different from those dependent on a large-scale fusion explosion.

Regarding the containment problem for this scheme, a unique situation exists. To begin with, in a deuterium-tritium reaction, about 80% of the energy released is in the form of very high energy neutrons, virtually all of which will escape the explosive undergraded in energy. The remainder is in the form of alpha particles (ordinary helium nuclei) which have extremely short ranges and would be swallowed up in the device itself to produce blase and heat; in what proportions would depend on the nature of the device. For a very light device (to be discussed shortly) considerably more of the energy would go

into heat. Using as an example a 10-ton fusion yield (a nominal yield assigned in the past for such explosives), the blast equivalent could very well be a tenth of a ton or even less, quite easily containable.

Unlike fission neutrons, these fusion neutrons, about ten times more energetic, can cause fission in U-238 which as mentioned is a practically costless material. Roughly three U-238 fissions will result from the absorption of one fusion-produced neutron. And since the energy released per fission is about ten times greater than that released per fusion reaction, an energy amplification of some thirty-fold can be affected very cheaply. Thus a 10-ton yield fusion device can lead to a 300-ton nonexplosive fission release.



To understand the heat produced by 300 tons of fission energy instantaneously released in the uranium shell would call for approximately 1,000 tons of uranium oxide, not only because the U-238 in oxide form has a higher melting point but also because oxygen will enhance the number of fissions produced were only U-238 involved. While this amount of material might seem quite large, it not only does not represent an unduly large cost investment but it also represents a virtually inexhaustible energy supply since on the order of 1/100,000,000 of the potentially available fission energy is produced by each fusion pulsing.

As to the energy output of such a system, were nuclear explosions to take place once every 10 minutes, this would represent the equivalent of about a 2,000-megawatt controlled fission reactor — on the same scale of large nuclear reactors that have been developed in the United States.

Regarding the economic advantage of this approach to nuclear power, insufficient information now exists to permit reliable estimates. At this time, research remains underway on pure-fusion devices, some approaches involving exotic new high energy materials which can turn the original development of Artsimovich into a new reality hitherto regarded as unaccomplishable. This has been going on in Russia and the United States, but in the United States the surrounding politics sharply limit the degree of progress that can be made. (As for the Russians, and any other country for that matter, even were a comprehensive nuclear test ban treaty to go into full effect, it would be virtually impossible to detect and verify such low yield bursts; and for that matter, to verify the construction and operation of these fusion-fission reactors were nations to be uncooperative. By unilateral U.S. decree this area is not a level playing field as far as the rest of the world is concerned.)

Aside from the unit cost of the pure-fusion device, in a number of ways this approach can be greatly, in some cases even vastly, cheaper than conventional fission power reactors. By comparison, the basic design couldn't be simpler. Maintenance couldn't be less complicated and cheaper. Waste disposal and fuel processing need not be a relevant factor, in view of the practically inexhaustible energy supply available in each facility. Reactor safeguards associated with conventional fission plants would be essentially nonexistent, there being no need for fuel rod replacement and fuel processing calling for inspection to prevent the illegal diversion of plutonium. The operating temperature could be substantially higher than in a conventional reactor, leading to a substantially higher efficiency in conversion from nuclear to electrical power. Unlike conventional fission power reactors which cannot be turned on and off to meet the needs of daily and seasonal variations in power consumption, the fusion-fission approach can be pulsed in accordance with need.

In the fall 1995 issue of this journal an article appeared ("Nuclear Terrorism Coverup") which described the terrorism implications of an extremely small pure-fusion explosive having yields comparable to the high explosive driven magnetic compression device discussed here. Such explosives in principle, and very possibly (even probably) in fact, could literally be as small as a baseball, not only providing an extremely fearful terrorist potential but also providing a great versatility for fusion-fission nuclear power because of the size and weight of the device.

Specifically the explosive referred to here is based on the development by Russia of a substance called "red mercury" which upon being detonated has far greater energy content then modern advanced high explosives, sufficiently greater as to make possible the ignition of a deuterium-tritium mixture. Despite an abundance of information indicating that red mercury indeed exists and has been smuggled out of Russia in substantial amounts, the official U.S. government position has been that it doesn't exist and has been a hoax perpetrated by certain elements (including President Boris Yeltsin, who has authorized its sale by a company run by one of his cronies in Russia) having a large Mafia influence upon gullible countries seeking to attain nuclear terrorism capabilities. However, considering the profound political and security implications of red mercury that do actually exist, one should realize that the government really has no choice but to deny such existence. To openly accept such a fact is politically unthinkable. But if indeed it is a fact, not only does the problem not go away through official denial, but it actually worsens because an unalarmed nation will take no steps to protect itself against such a threat. It is curious that while denying the existence of red mercury, the government has provided no information to explain in any technical way why this is so. In fact, there appears to be a gag on government

officials and nuclear weapons laboratories working under the auspices of the government from appearing publicly. As one prominent example, a very popular NBC television program ("Unsolved Mysteries") put on a red mercury segment and invited the government to send a qualified representative. The government declined.

With respect to the fusion-fission power scheme described here, the ideal explosive device would be based on red mercury or other substances having similar properties, which fall in the category of "bellotechnic" materials. Insofar as the U.S. pursuing this approach, work has been going on, but its practical fruition will not take place; the actual development and testing of these devices are forbidden by U.S. law. Any other country not party to the nuclear test ban treaty is free to pursue this area — possibly, even probably, aided and abetted by Russia. However, aside from these political considerations, there is the question of the cost of these red mercury-type pure fusion explosives. At least in the United States, there appears to be no open knowledge or even discussion on how cheaply red mercury, or some equivalent substance, can be made.

The Russians have been smuggling red mercury off to a number of countries, for malevolent purposes, at practically astronomical prices; which seems perfectly plausible if terrorist application is the major consideration. (If the target is, say, the U.S. White House, what difference does it make how much the red mercury costs? The political repercussions would outweigh in importance the cost entailed by an enormous factor. On the other hand if the objective is effective nuclear power generation involving the detonation of many thousands of these devices, there seems every reason to believe that red mercury costs may be vastly less than the smuggled cost. What the cost might be were this material to be mass produced for peaceful application is not available from the U.S. government which denies its very existence. But if the government will not, and cannot, participate in such evaluation, at least the U.S. scientific community should be allowed to probe the matter. This, of course, would be fiercely resisted and perhaps even forbidden by the government, for fear of the national security implications (even though such implications are ruled out). However, nuclear power is much too important for our future to be allowed to wither away because of unrealistic nuclear policies.

On this note, this discussion comes to an end. Its purpose has been to bring forth a new and novel approach to nuclear power which offers the potential for significantly lower-cost power than achievable through conventional fission reactors and poses none of their safety problems. The details of what may lie in the offing, taking this approach, will have to await the outcome of pure-fusion explosive development. To be sure, at least in the United States, there will be major political obstacles to be overcome. Considering the sorry history of U.S. nuclear power plants and the politics that have been smothering efforts to move forward in this area, there is little over which to be sanguine — unless:

As the saying goes, "necessity is the mother of invention." In this case, current and currently projected political constraints may prevent new innovative nuclear power schemes from bearing practical fruit. However, this can always change as events bring about drastic and prolonged energy shortages, with huge attendant costs. Such changes are not predictable, but sooner or later they may very well occur; and when this time comes and we have made no plans for dealing realistically with the matter, we shall suffer accordingly. With the exception of U.S. nuclear policy, nothing is forever, and the world supply of conventional fuels may not be available forever — and perhaps much less than that. We should stop banking on "forever" and begin to seriously consider what might be accomplished should "forever" come to an end much sooner than we now anticipate. ■

JCD illustration by Pamela Thornbloom

***Sam Cohen** is a retired nuclear weapons analyst. He worked and/or consulted for the Manhattan Project, Rand corporation, Los Alamos and Livermore Nuclear Weapon Laboratories, the U.S. Air Force and the Secretary of Defense. He is noted for developing the concept of the neutron bomb.*

The views expressed in this article are those of the author and do not necessarily reflect those of The American Civil Defense Association. The Journal of Civil Defense *invites feedback from its readers on the concepts presented in the article.*

The Russians have been smuggling red mercury off to a number of countries.

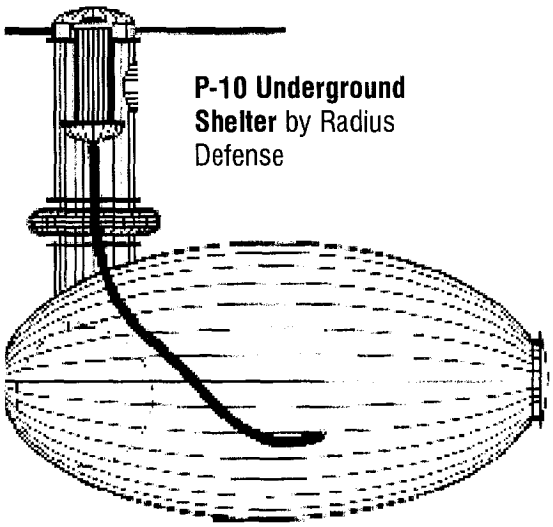
Re:Views

Books, Ideas and Technology

This issue: technology

P-10 Underground Shelter, developed by Walton McCarthy of Radius Defense, Inc. 222 Blakes Hill Road, Northwood, N.H. 03261, tel. (603) 942-5040.

The P10 Underground Shelter is the third generation of McCarthy's designs. This shelter is almost twice as large as his former design, the ES10, which has been in service for more than seven years. The new larger design was developed for a very long-term shelter stay. This is the second model introduced within the last year. The P10 is a paraboloid shape and is all structural fiberglass. It is designed with no steel parts. The hatch at ground level is made of fiberglass with an option for combat fiberglass composite for those applications requiring bullet resistance from Class 1 to Class 4. The P10 reportedly has no radar signature, no thermal signature, no metallic signature, and the visual signature is very hard to recognize.



P-10 Underground Shelter by Radius Defense

The entrance is connected to the shelter using a fiberglass seismic joint to allow the entrance way to move independently of the shelter. This design allows the entrance to move laterally and vertically from ground shock. A connector port allowing multiple shelters to be connected together is standard on this model.

Food storage has been increased to allow plastic grain bins under the floor storing 300 gallons in 1- to 3-gallon plastic canisters.

The P10 is sold in three different models. The P10S is an empty P10 to be used for storage and sells for $17,000.

The P10B is minimally equipped to become a fully functional shelter at some later date without any further excavation and sells for $18,500.

The regular P10 is a complete turnkey unit needing only food and water; it sells for $23,500. Installation nominally requires one day. ■

Compiled by JCD staff

TACDA Letter

For members of
The American Civil Defense Association
Summer 1997

We need your help!

We regularly get questions from *Journal* readers and Internet visitors about various aspects of civil defense. We try to answer as best as our knowledge and time allow, but it would help if we could also draw on the expertise of our members and associates.

Could we refer some of the incoming questions to you? **We would not give out your name or contact information unless you say we may.**

If you'd like to help, please send answers to the following questions to us (see response information below).

1. What civil defense expertise do you have (please be as specific as you can about your background)?

2. Would you be willing to help answer questions related to your expertise?

3. Would you be willing to have your name and contact info given to someone with a question?

4. How can we contact you? Please tell us your name, postal address (including ZIP), phone, fax, and e-mail address.

5. Any further comments or restrictions on using the above information?

Many thanks for any help! Send your responses to:

TACDA, P.O. Box 910, Starke, Fla. 32091
Phone: (800) 425-5397
Fax: (904) 964-9641
E-mail: tacda@daccess.net

Best regards,

Your TACDA leaders and staff

Upcoming Events

Info

The Journal of Civil Defense *does not take responsibility for the accuracy of the following information. Any or all of the information is subject to change without notice.*

1997

Sept. 1-6.
Ninth World Water Congress: Water Resources Outlook for the 21st Century - Conflict and Opportunities, Montreal. Info: International Water Resources Association, 1101 West Peabody Drive, Urbana, Il 61801-4723

Sept. 1-12
Training of Trainers in Disaster Management and Protection, Oxford, England. Info: OCDS, P.O. Box 137, Oxford OX4 1UE, England; tel: 44 1865 202772; fax: 44 1865 202848; e-mail: 100612.1153@compuserve.com. Offered by: Oxford Centre for Disaster Studies.

Sept. 5-7
Preparedness & Self-Reliance Expo, Erie Co. Fairgrounds AgriCenter, Hamburg, N.Y., Buffalo, N.Y. Info: Mike Duve, (800) 844-6782 or (614) 891-1225. Cost $500

Sept. 7-10
1997 Association of State Dam Safety Officials (ASDSO) Annual Conference, Pittsburgh. Info: Susan Sorrell, Conference Coordinator, ASDSO, 450 Old East Vine, Second Floor, Lexington, Ky 40507; (606) 257-5146; fax: (606) 258-1958.

Sept. 8-12
Retrofitting Flood-Prone Residential Buildings Course, Emmitsburg, Md. Info: Dan Bondroff, FEMA - National Emergency Training Center, 16825 South Seton Avenue, Emmitsburg, Md. 21727; (301) 447-1278. Offered by: Federal Emergency Management Agency (FEMA) Mitigation Directorate and Emergency Management Institute.

Sept. 8-12
Asia-Pacific Disaster Conference 1997, Kauai, Hawaii. Info: Center of Excellence in Disaster Management, 1 Jarrett White Road (MCPA-DM), Tripler AMC, Hawaii 96859-5000; (808) 433-7035; fax: (808) 433-1446; e-mail: kanemota@website.tamc.amedd.army.mil; WWW: http://website.tamc.amedd.army.mil. Sponsor: Center of Excellence in Disaster Management and Humanitarian Assistance and the Pacific Disaster Center

Sept. 8-12
Sixth Regional International Decade for Natural Disaster Reduction (IDNDR) Disaster Management Meeting, Brisbane, Australia. Info: Emergency Management Australia; tel: 61 +6 266 5408; fax: 61 +6 266 5029; e-mail: ema@ema.gov.au - or - United Nations Department of Humanitarian Affairs - SPPO; tel: (679) 303239; fax: (679) 304942; e-mail: undha@is.com.fj. Sponsors: Australian IDNDR Coordination Committee and others. (Held in conjunction with the South Pacific Disaster Reduction Programme (SPDRP) Tripartite Review and the European Union (EU) "Upgrading Tropical Cyclone Warning System" Project).

Sept. 9-10
Civil Emergency Preparedness: Risk, Crisis, Security and Vulnerability in Society, Umea, Sweden. Info: Carola Lofstrand, Department of Social and Economic Geography, Umea University, S-901 87 Umea, Sweden; tel: +46-90-167918; fax: +46-90-166359; e-mail: carola.lofstrand@geography.umu.se. Sponsor: National Board of Civil Preparedness in Sweden.

Sept. 10-12
Thirteenth Semiannual Meeting of the Floodplain Management Association, Sacramento, Calif. Info: Mark Forest, 961 Matley Lane, Suite 110, Reno, Nev. 89502; (702) 329-6123; fax: (702) 322-9380; e-mail: mforest@harding.com; WWW: http://home.navisoft.com/fldplnma.

Sept. 10-13
"First Due" Fire and Rescue Conference and Exposition, Norfolk, Va. Info: Jems Communications, P.O. Box 2789, Carlsbad, Calif. 92018; (800) 266-5367; WWW: http://www.jems.com. Sponsor: Fire Rescue Magazine and others.

Sept. 13-16
National Coordinating Council on Emergency Management (NCCEM) 1997 Annual Conference, Tempe, Ariz. Info: NCCEM, 111 Park Place, Falls Church, Va 22046-4513; (703) 538-1795; fax: (703) 241-5603; e-mail: nccem@aol.com.

Sept. 13-17
1997 International Public Works Congress and Exposition, Minneapolis. Info: APWA, 2345 Grand Boulevard, Suite #500, Kansas City, Mo. 64108-2625; (816) 472-6100; fax: (816) 472-1610; WWW: http://www.pubworks.org. Sponsor: American Public Works Association (APWA). Including a complete track on emergency management.

Sept. 13-17
Second World Assembly of Non-Governmental Organizations (NGOs) for Disaster Reduction, Phoenix, Ariz. Info: Joint Assistance Center, G-17/3, Qutab Enclave-1, Gurgaon-122002, Haryana, India; tel: 0091-124-352141, or 0091-124-353833; fax: 0091-124-351308; e-mail: nkjain@jac.unv.ernet.in; - or - Krishna Gopalan, Secretariat WANDR II, P.O. Box 14481, Santa Rosa, Calif. USA 95402; tel: (707) 573-1740; fax: (707) 528-8917; e-mail: jacusa@juno.com. Sponsor: Joint Assistance Centre of India and others.

Sept. 15-17
Ninth International Disaster Recovery Symposium and Exhibition, Atlanta. Info: Mercedes Knese, c/o Disaster Recovery Journal, P.O. Box 510110, St. Louis, Mo. 63151-0110; (314) 894-0276; WWW: http://www.drj.com.

Sept. 15-18
Volcanism and Volcanic Hazards in Immature Intraplate Oceanic Islands, La Palma, Canary Islands, Spain. Info: W.J. McGuire, Department of Geological Sciences, University College London, Gower Street, London WC1E 6BT, U.K.; e-mail: w.mcguire@ucl.ac.uk. Sponsors: Estacion Volcanologica de Canarias, Geological Society of London, and others. Includes sessions on land-use planning and risk mitigation.

Sept. 17-19
Fourth National Conference on Earthquake Engineering, Ankara, Turkey. Info: Prof. Haluk Sucuoglu, Middle East Technical University; tel: +90 312 210 54 80; fax: +90 312 210 13 28; e-mail: eerc@rorqual.cc.metu.edu.tr; WWW: http://www.metu.edu.tr/~wwweerc. Sponsor: Turkish National Committee for Earthquake Engineering.

Sept. 18-20
Nature's Workshop: Environmental Change in Twentieth Century Southern California, Northridge, Calif. Info: Southern California Environment and History Conference, c/o Center for Southern California Studies, California State University, Northridge, Calif. 91330-8371, attn: Lorna Fenenbock, Conference Coordinator; (818) 677-6518; fax: (818) 677-7115; e-mail: scehc@csun.edu or crodrigue@oavax.csuchico.edu. Sponsor: Southern California Environment and History Conference Planning Group. Submissions due May 20.

Sept. 22-23
Eighth Annual Conference of the Colorado Association of Stormwater and Floodplain Managers, Vail, Colo. Info: Susan Hayes, City of Fort Collins Stormwater Utility, 235 Mathews Street, Fort Collins, Colo. 80524; (970) 221-6589; fax: (970) 221-6239.

Sept. 22-24
Colorado Association of Stormwater and Floodplain Managers (CASFM) Annual Meeting, Vail, Colo. Info: CASFM, P.O. Box 22673, Denver, Colo. 80222-0673.

Sept. 22-25
Joint Conference of the Canadian Dam Safety Association and the Canadian Committee on Large Dams, Montreal. Info: Christian Guillaud, CDSA/CANCOLD Conference Committee, c/o SNC Lavalin Inc., 1100 Rene-Levesque Boulevard West, Montreal, Quebec, Canada H3B 4P3; (514) 393-1000; fax: (514) 876-9273.

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