

## Pyrotechnics Experts Aim For a Big Bang in the Sky

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The company putting on the fireworks displays Sunday night at the Quantico Marine Corps Base aims to please by shooting shells every three to four seconds in a dazzling display of pyrotechnics.

"Our goal is to keep the sky full," said Dennis Coster, president of Fireworks Productions Inc. of Glen Rock, Pa.

The aerial displays on the Fourth of July, which will last 20 to 30 minutes, have been planned since fall. "Twenty to 25 minutes is the average attention span of a crowd," Coster said. "After that, no matter what's going on in the sky, the audience starts to get antsy."

Although the fireworks display on the Mall always draws the biggest crowd in the region, thousands of local residents opt for smaller shows closer to home. In addition to the Quantico display, which will be at 9:25 p.m. Sunday, Fireworks Productions will oversee shows in Loudoun, Fauquier and Fairfax counties.

Behind each show are dozens of calculations and practical considerations, right down to the clothing worn by the crews.

"The shooters can't wear any polyester or acrylic, because it's a fire hazard," said Lansden Hill, president of Pyro Shows, a Tennessee-based company hired to stage the fireworks display on the Mall. "So they stick to 100 percent cotton."

Coster's teams will spend up to six hours at each site setting up the displays, which vary in size and number of fireworks.

"Each of the Fairfax displays probably will have between 500 to 800 shells," Coster said. "Great Meadow [in The Plains in Fauquier], our biggest display, will have about 1,000 shells, and Quantico will have around 800."

Pyro Shows, which was scheduled to begin setting up Tuesday, will use more than 2,600 shells, some of which have as many as 30 additional shells inside.

The size of the shell, which sends out a burst of colorful, showy "stars" in a predetermined pattern, is dictated by National Fire Protection Association regulations that set a ratio between the shell's diameter and the distance between the staging area, the crowd and nearby buildings. Shells range from 1 3/4 inches to 36 inches in diameter; most of the fireworks in the local shows will be from two to six inches. But at the Great Meadow display Sunday, some shells will be as large as 12 inches in diameter, because the clearance there is greater, Coster said.

The largest shells at the Mall are 10 inches, Hill said. An added challenge to planning the Mall display is a National Park Service request that the fireworks break open above the Washington Monument, which is 555 feet high.

"For every inch in diameter, a shell rises 100 feet in the air, so the smallest shells we'll be using are six-inch shells, which will break at 600 feet," Hill said.

Each show is manned by "shooters," who do just that -- fire the shells. Their job, Coster said, is dirty, labor-intensive and often hot, especially because they wear protective gear. But properly

trained shooters are in no danger, the company president said. "We practice safety techniques, and you don't ever get complacent."

The larger fireworks usually are loaded in rows of steel or fiberglass launch tubes called mortars, which are embedded in sand-filled drums or buried in the ground. Smaller fireworks -- those from 2 1/2 to 6 inches in diameter -- are put in wooden racks on the ground. Electronic or manual controls trigger their launch, lifting the devices skyward as a time-delay fuse burns.

The shows follow a familiar script: an opening barrage followed by the main production, culminating in a grand finale. Hill promised a "stair-step increase in intensity that becomes the finale, with the grandest part happening during the last 60 seconds, when we fire 10 shells per second and a thousand salutes, which are the explosive sounds you hear."

Coster said his shows will end with a teaser. "We have a false finale, then pause a few seconds before firing the real finale," he said.

Although it's now possible to fire shows using computers, Coster and Hill said they would fire the shows in Fairfax and on the Mall electronically using their shooters. Coster said he also planned to fire some shells manually.

"It's the same principle as using a road flare," he said.

"The Park Service and the public will forgive just about anything but black sky," Hill said. "Computers are a tad temperamental. They don't like dust, heat and loud noise. That's what you get at a fireworks display."

The six shooters firing the Mall display will use individual power supplies and electronic firing controls with enough steps built into the process to enable them to stop a launch if there are unexpected problems.

Coster and Hill said they expect their shows to be spectacular, especially now that manufacturers are making pyrotechnics with more colors than ever.

"You're seeing new colors now, like orange and aqua, that you didn't see a few years ago," Coster said. "But patterns and figures in the sky are the big thing. They form double hearts or the planet Saturn or serpents with swishing tails. That's what gets the most oohs and aahs from the crowd."

John Adams, the country's second president and one of the signers of the Declaration of Independence, would probably be pleased. On July 3, 1776, the eve of the adoption of that historic document, Adams wrote that he hoped "the most memorable day in the history of America" would always be celebrated with pomp, parades, bonfires and fireworks. He got his wish. More fireworks are ignited during Fourth of July events than for any other celebration in the world.