

Winds of Change...

Using Air as a Tool

Turning a hot air balloon inflator into the firefighters most aggressive fire attach tool... Blowing massive amounts of air into a burning structure to remove heat gas and smoke.

by **Dexter Scorch Coffman**

Since 1987 I have had the unique opportunity to be involved in building a business that has dramatically changed fire fighting worldwide. We started a Hot Air Balloon Inflator company; we evolved into a Fire Equipment Manufacturer making Positive Pressure Ventilation Blowers that are used in aggressive fire attack.

Although this has been a 15-year experience similar to Don Quixote: we have prevailed. The technique is now a part of fire fighting protocol and although not all fire departments are using it for fire attack they are for overhaul. As they become trained and comfortable with PPV they will move forward to the next stage. This all began with a balloon inflator.

Balloonists have contributed much fun, laughter and memories to millions but most importantly we have contributed a product that has dramatically changed firefighting worldwide.

Because of our high speed powerful blowers people now survive fires. Firefighters enter burning structures in an upright position with a clear field of vision and in a cool clean environment. This protects them from exposure to toxins that cause long term health problems. It will allow them to see their grand children, great grand children and live healthier lives. It allows them to be safer and faster.

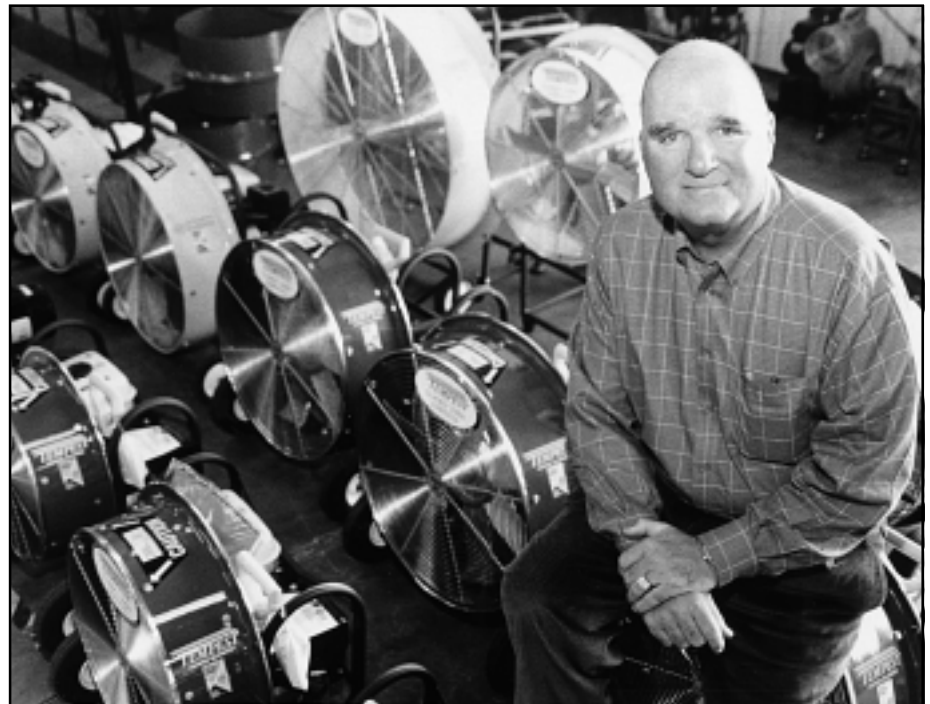
Balloonists need the most air and the fastest inflation. Before modern hot air ballooning there were no fans like our inflators.

Our technology has been adapted and improved to make life safer for so many. I always make sure the fire industry knows that the PPV Blower began as a balloon inflator. I believe it demonstrates the Yankee Ingenuity that America is famous for and we as Balloonists can be proud of this contribution. I am because I have been able to participate in two wonderful industries; Ballooning and Firefighting. I have gained many friends worldwide and

hopefully made the world a little better.

It all started when Tempest Technology Corporation was co-founded in August 1987 by Dexter Coffman and Don Hamman both hot air balloonist. Don had designed a better inflator fan for his hot air balloon business and invented the Tempest Belt-Drive-Power Blower.

Balloonist traditionally built inflators by attaching a wooden blade to a lawnmower engine. A simple frame is



Dexter Scorch Coffman of Tempest Technology has taken the balloon inflator fan and helped change fire fighting worldwide.

fabricated and a wire cage is used to enclose the blade. The problem with this "direct-drive" design is that it vibrates, walks forward and turns right. This generally requires a crewmember to "man" the fan to keep it in place. Don Hamman had a limited crew and could not afford a "paid crew" person to attend the fan.

His goal was a fan that would inflate, in place, unattended. He started with a belt-drive design that lowered the center of gravity of the blower and absorbed engine vibration. To this design he added a spun aluminum shroud, which would provide additional protection from the blade and a seven bladed cast aluminum impeller, which would increase the fan's performance. The result was a fan that performed better than any other and was safer for the crew and passengers in the inflation vicinity.

After limited success selling his new inflator to Balloonist he looked for new uses to his high-speed powerful blower.

The first sale outside ballooning was for large aircraft brake cooling.

Around this same time, Don's grandmother heard a fire department in Bakersfield California was experimenting with Positive Pressure Ventilation, a new fire fighting technique that involved gas fans.

Los Angeles City Fire Department fire fighters, as all fire departments, had been using 1/3 HP electric fans to remove smoke by ejection (sucking air out) during overhaul since the 1940's. In 1954 LA City FD became concerned about the residual smoke with the new petrochemical based plastics and synthetic fibers and materials.

Now during overhaul the smoke contained dangerous chemicals that had long-term health dangers. They decided rather than trying to pull dirty air out of a structure during overhaul they should blow clean cool air in. They first tried turning their electric fans around, but it did not have enough air movement. Then they stacked one on top of another. It still did not have enough air movement. They then stacked a third one and blew the circuit breaker, shutting down the fans.

One of the fire captains involved had

Above right: *Tempest Techonology's 24 inch, 5 hp, belt driven fan.*

Right: *Typical inflator fans found in ballooning, on display in Albuquerque.*



Coordinated Fire Attack



- Hose Lines Ready and Charged
- Blower Running
- Ventilation of Fire Room

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Progressive Interior Fire Attack



- Search and Rescue
- Heat and Toxic Gases Quickly Reduced
- Direct Attack on Fire
- Victims and Firefighters Environment Quickly Improved
- Steam Away From Firefighters
- Flash Over Minimized

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a neighbor who owned Controlled Air-streams a gasoline blower manufacture in the Los Angeles area. (Also a balloon inflator maker) Tempest purchased this company in early 1989.

Testing a Controlled Air Stream 3.5 hp gas driven Direct-Drive Fan they discovered that by placing the fan on the outside of the structure, blowing inwards, they could remove the residue smoke actually forcing the dirty interior air out and replace it with a clean cool environment. The increase to 3.5 hp and the design of an air movement blade and shroud provided the velocity and dynamics to push large amounts of air downwind. LA City termed it Positive Pressure Ventilation.

In 1987 Kern County FD was testing two fans, one electric and one gas to see if they would adopt the LA City technique of Positive Pressure Ventilation.

Tempest asked if they could bring their Belt-Drive Power Blower and be part of the evaluation? It turned out the Tempest Power Blower was more effective than any other fan design. The spun aluminum shroud created a very effective "air cone" which is necessary for PPV. The seven bladed aluminum impeller also created a great deal of pressure that allowed the blower to push air through the structure more efficiently. The Tempest cleared the entire firehouse in minutes compared to an hour or more by the other fans.

Kern County began using Tempest for PPV in overhaul. As they did they began to question, "If we can clear heat gas and smoke from the building this fast after the fire is out why can't we do it while the fire is burning?"

One night they answered a fire call and upon arrival saw a woman in a second floor window screaming about her children being in the house. They immediately sent in a rescue crew who crawled on hands and knees in heavy thick smoke to the second floor. While they were doing this Chief Cliff Almand ordered the Tempest to start PPV.

Immediately the structure cleared of smoke and heat. The second crew in discovered the children on the couch on the first floor area, not on the second floor

Fire fighters ready to attach.



where the rescue crew went. PPV allowed two of the children to survive. PPV as an aggressive fire attack tool was born.

Chief Cliff Almand of Kern County began teaching Aggressive PPV in late 1987. Along with Chief John Mittendorf of LA City the two of them carried the message that high-speed powerful gas blowers could replace a hostile hot smoky environment with a cool clean one. Firefighters could walk into a fire in a cool clean upwind environment and potential victims could get fresh air and survive.

Tempest recognized early on that the best way to increase acceptance of PPV was through training. If fire fighters learned the physics of why PPV works and were taught procedures for the proper implementation of PPV, they would feel comfortable with it.

Not being active fire fighters, we knew that we were not qualified to develop the training program. Tempest sponsored a national symposium and brought together the most knowledgeable professionals in the United States on ventilation techniques and PPV. The ideas discussed in this symposium became the basis for the Tempest Training System.

Since that first test in 1987, Tempest has helped PPV to become an accepted ventilation technique and dramatically changed fire fighting worldwide. The most interesting thing is it took from 1954 to 1987...33 years to move the knowledge 120 miles from Los Angeles to Bakersfield. With the higher horse power and larger blades PPV had the force to clear structures that smaller gas units couldn't. This resulted because we needed to inflate balloons faster and faster.

However, it was the vision of key people in the fire service that made PPV work. They were willing to take risks and try a radical concept. In an industry that prides itself on tradition, PPV was a very un-traditional approach to fire fighting!

In 1989 Don sold his interest in Tempest to me and I embarked on a road to help make Positive Pressure Ventilation a Standard Operating Procedure in fire fighting. I recognized that we have to show the fire service the technique and let them take it from there.

One person who did a lot of the pioneer fieldwork on this was Charles Willard who left his job as Chief Balloon Designer at the Balloon Works and dedi-

cated himself to the task of educating, demonstrating and applying PPV through out the world.

Tempest assists fire professionals in the U.S., England, Germany, Canada, Australia, Japan and other countries with testing PPV techniques and procedures. PPV has grown from being simply an overhaul tool to an aggressive attack tool. Tempest recently produced a training video titled "Positive Pressure in Fire Attack" with the assistance of the Salt Lake City Fire Department, which is one of the most progressive departments in the world in the use of PPV as an attack tool.

Tempest continues to pioneer new applications for PPV. It has discovered that industrial customers use PPV for the removal of dust, fumes, and carbon monoxide and the golf and turf industries for drying and cooling greens. They can all use the same PPV smoke and dangerous gases technique that fire firefighters use.

The latest development by Tempest is the Mobile Ventilation Unit (MVU). The MVU is a 1.25m diameter, hydraulically powered blower that is used to ventilate highway and train tunnels, large warehouses, airports and aircraft.

When mounted on a truck, trailer or rail car the Tempest MVU can assist fire fighters with fire fighting and rescue operations by quickly removing heat gas and smoke from tunnels up to six kilometers long. The units have worked so well that Fire Departments and Industrial Fire Brigades in Europe have purchased 15 MVU Units

Additionally with the terrorist threats the MVU with its misting system can be used for a wash down and for mass decontamination.

Using air as a tool works. It gives firefighters control of the hostile environments; they can clear it out and see what they have to deal with. PPV/PPA also allows the firefighter to make better management decision because they are less stressed and they can see the fire and its movement, in some cases they can even use PPV/PPA to hold the fire in an area.

Most important without the heat to build up in the structure fire cannot extent without smoke (unburned particles of combustion) flash over is reduced or eliminated. But you must remember that it takes training and understanding the dy-

namics of PPV/PPA to reach the level to use it in aggressive Fire Attack.. Every Department we know starts with PPV on overhaul and as they see how easy and dynamic it is they move into PPA. Once they have used it in Positive Pressure Attack they tend never to go back to the old way.

Remove the heat, gas and smoke, attack the seat of the fire and get the steam out of the structure. Job Done.

We still have a lot of work ahead of us and the job is to keep blowing in the right direction to effectively keep the winds of change moving...

Yankee Ingenuity through ballooning has changed the way the world fights fires that is also a job well done *be proud...*

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Information and studies on PPV/PPA at: www.tempest-edge.com in the Library section



Top: Tunnel ventilation.

Middle: Truck mounted 48 inch fan.

Bottom: Brake cooling.