



# Safety Beacon



Official Safety Newsletter Of The Civil Air Patrol

July 2011

## BEACON NEWSLETTER TEAM

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# SAFETY BRIEF

Number 6

## Pneumatic Systems

*While accidents due to pneumatic system failures are rare, they are almost always fatal.*

Pneumatic systems, commonly known as vacuum or pressure systems, power the heading and attitude indicators in most general aviation (GA) aircraft, and in some aircraft, also power the autopilot and de-ice systems. For pilots who regularly fly at night or in instrument meteorological conditions (IMC) these systems are essential. This ASF Safety Brief explains how the pneumatic system works, how to recognize a system failure, and system redundancy options.

### Basic Operation

Pneumatic systems in GA aircraft are pretty straightforward. The heart of these systems is a pressure or vacuum-creating engine driven air pump.

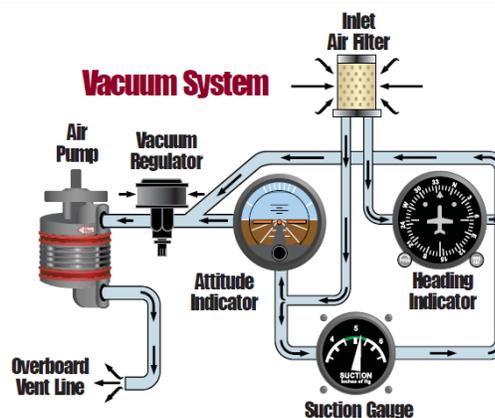
The air pump draws air into the system through a filter. The fast-moving stream of air passes over the vanes within the heading and attitude indicator gyros, causing the gyroscopes to rotate at about 10,000 RPM. In many aircraft, the same air pump powers the autopilot and de-ice systems.

There are two basic types of air pumps: wet and dry. Wet air pumps use engine oil to lubricate the inside of the pump. The more common dry air pumps have graphite vanes inside the casing which self-lubricate as they rotate.

### Early Recognition of System Failure

Recognizing a pneumatic system failure early is important during any operation, but when flying IMC or night VFR it could be the difference between life and death.

To accurately and quickly recognize a pneumatic system failure, you must first understand which flight instruments are pneumatically powered. In most air-



The heading and attitude indicators in many GA aircraft are powered by the pneumatic system.

craft, these would be the heading and attitude indicators, although in some newer aircraft these flight instruments are electrically powered. Check the aircraft's pilot operating handbook (POH) for specifics.

If the autopilot is also powered by the pneumatic system, the consequences of a system failure are magnified; just when the autopilot is needed the most, it's no longer reliable.

### Signs of Failure

Early recognition of pneumatic system failure is complicated because the first warning signs can be subtle. Vacuum or pressure powered flight instruments will slowly begin to give conflicting and inaccurate information, so proficiency in instrument scanning is vital. It's important to include the suction or pressure gauge as part of your scan pattern, because a low reading will often signal a failure before the gyros start giving inaccurate indications.

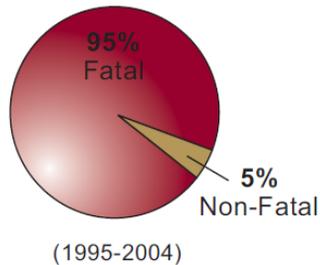
Pilots should consider installing easily visible annunciator warning lights, inoperative flags on the gyros, or flow indicators for early warning of a pneumatic systems failure.

Early recognition of a pneumatic system failure can significantly decrease the chances of spatial disorientation.



Annunciators and flags provide an early indication of a pneumatic system failure.

While pneumatic system failures alone do not cause accidents, spatial disorientation does, and tragically these accidents are almost always fatal. (See figure below.)



To help avoid spatial disorientation:

- Install a backup power supply to the pneumatic system (see the Redundancy section below)
- Keep the suction gauge in your instrument scan
- Become and stay proficient at partial panel flying
- Cover up inoperative instruments during a failure
- Make timed turns instead of using the heading indicator
- Notify ATC of the situation and declare an emergency
- If in IMC, consider flying toward the closest VMC
- Check the weather at the nearest airport with a precision instrument approach
- Ask ATC for a “no gyro approach”

Pneumatic system failures can occur at any time, regardless of the age of the system. Causes include:

- Contamination by solid particles from within the pneumatic system that can damage the pump and plug valve openings.
- Liquid contamination from oil, water, or engine cleaning solvents.
- A loose fitting or damaged hose allowing contaminants into the system past the filter.
- Worn out, misused, or incorrectly routed hoses.

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- Abrupt engine deceleration (which can be caused by the propeller hitting water or tall grass).
- Sudden engine stoppage, such as that caused by a prop strike against a solid object.

Whether you're an aircraft owner, renter, or operator defense against pneumatic system failure begins with a review of the maintenance logs and a talk with the mechanic who most recently worked on the aircraft. Study and adhere to the aircraft and component part manufacturer's recommendations regarding inspection and replacement intervals of pneumatic system component parts.

### Redundancy

Redundancy in a pneumatic system can take a load of worry off your plate. While many newer aircraft come with redundant systems, older aircraft usually do not. Pilots who frequently fly in IMC or night VMC should install pneumatic system redundancy.

Redundancy comes in several forms. Options include:

- Electrically-powered backup attitude and heading indicators
- Air pump redundancy with an electric or engine driven pump
- Standby vacuum system that utilizes the pressure differential from the engine's intake manifold

### Points to Remember

Here are the key points to remember about pneumatic system failures:

- Pneumatic systems fail. Expect it and be prepared.
- You can lessen the likelihood of a failure by making sure the pneumatic system has been properly maintained.
- Consider installing a backup system and a prominently placed annunciator.
- Stay current on instrument scanning techniques and partial panel flying.

With these points in mind, you can feel more at ease the next time you need to rely on your pneumatic powered flight instruments and systems.

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SB06-06/06



## Extreme Heat

A heat wave is an extended period of extreme heat, and is often accompanied by high humidity. These conditions can be dangerous and even life-threatening for humans who don't take the proper precautions.

### Step 1: Get a Kit

- Get an [Emergency Supply Kit](#) which includes items like non-perishable food, water, a battery-powered or hand-crank radio, extra flashlights and batteries.

### Step 2: Make a Plan

#### Prepare Your Family

- Make a [Family Emergency Plan](#). Your family may not be together when disaster strikes, so it is important to know how you will contact one another, how you will get back together and what you will do in case of an emergency.
- Plan places where your family will meet, both within and outside of your immediate neighborhood.
- It may be easier to make a long-distance phone call than to call across town, so an out-of-town contact may be in a better position to communicate among separated family members.
- You may also want to inquire about emergency plans at places where your family spends time: work, daycare and school. If no plans exist, consider volunteering to help create one.
- Be sure to consider the specific needs of your family members
  - Notify caregivers and babysitters about your plan.
  - Make plans for your pets
- Take a Community Emergency Response Team (CERT) class from your local [Citizen Corps chapter](#). Keep your training current.

## **Step 3: Be Informed**

### **Prepare Your Home**

- Install window air conditioners snugly; insulate if necessary.
- Check air-conditioning ducts for proper insulation.
- Install temporary window reflectors (for use between windows and drapes), such as aluminum foil-covered cardboard, to reflect heat back outside.
- Weather-strip doors and sills to keep cool air in.
- Cover windows that receive morning or afternoon sun with drapes, shades, awnings or louvers. (Outdoor awnings or louvers can reduce the heat that enters a home by up to 80 percent.)
- Keep storm windows up all year.

### **Listen to Local Officials**

Learn about the emergency plans that have been established in your area by your [state and local government](#). In any emergency, always listen to the instructions given by local emergency management officials.

For further information on how to plan and prepare for extreme heat, visit: [Federal Emergency Management Agency](#), [American Red Cross](#) or [NOAA Watch](#).

## ENCAMPMENT 2011



Wing encampments generally consist of long days and lots of fun activities. Arriving at the encampment in the best physical condition possible is a good thing.

If a cadet has been ill, parents should ensure that they are well enough to attend and to let the encampment staff know of any known medical condition or recent illness.

Most encampments during in-processing of the in-flight cadets will conduct a light medical screening in order to ensure any medical conditions are confidentially identified.

Cadets that have recently been exposed to any infectious disease should obviously not attend. If you have any concerns or questions, contact the Wing's Encampment Commander prior to arrival.

One of the major medical problems at encampments are blisters. If you are planning on attending an encampment, make sure that your boots fit and that they are well 'broken in' prior to arriving at the encampment. Make sure that you bring everything required. Most encampments will not only publish an established equipment list but will also list items that should not be brought or "contraband". Forbidden items typically include game boys, CD players, cell phones, food, etc. and/or illegal items (i.e., alcohol, illegal drugs, tobacco products). Forbidden items generally will be confiscated at in-processing and returned at the end of the encampment. It is better to not bring them in the first place. Any cadet found to have illegal items may be dismissed from the encampment.

If a cadet needs to bring any medications (either prescription or over the counter), it is necessary for the parent to sign a "Cadet Medication Release". Most encampments' will include this in either a welcome package or make it available for download on their website.

Each encampment communicates with parents, cadets and senior members differently. However, it is important for parents of cadets and CAP personnel attending an encampment to communicate with the staff on any issue which may pose a medical or safety issue for a cadet or themselves. This may include last minute medical updates, recent family emergencies, or educational difficulties.

Most encampment flight's consist of anywhere from 12-17 cadets on average and are led by fellow staff cadets such as a Flight Sergeant and Flight Commander. Most encampments require staff cadets who have already attended an encampment as an in-flight cadet. Encampment senior staffs generally work with the flights as TAC Officers or Flight Mentors. The number of senior member "mentors" and staff varies from encampment to encampment, and typically it is not unusual for an encampment to have 40+ senior members serving on an encampment staff.

## Supervision at the Encampment



Sleeping arrangements vary from encampment to encampment and may include tents, cabins and barracks or a combination of any of these. The ultimate responsibility for the cadets and the week's events rests on the Encampment Commander.

## Medications at the Encampment

Cadets can bring medications (both prescription and over-the-counter) to an encampment but if the cadet is younger than 18, most encampments will need a release signed by a parent or guardian for the cadet to self-medicate. In addition all medications must be in original containers with dosing instructions and labeled with the cadet's name. Prescription containers must contain the name of the prescribing physician, name of dispensing pharmacy, recipient name and any instructions for dosage.

Generally a Self Medication Release Form must be brought to registration at the encampment with the designated medications.

Even if a cadet is NOT bringing any medications, the encampment staff's need to have parent's sign some sort of form or release indicating whether non-prescription medicines can be dispensed as needed to a cadet under the age of 18.

Civil Air Patrol has recently issued a new regulation (CAPR 160-002 Handling of Cadet Medications). This regulation is in effect for all cadets under age 18 for ALL encampments nationwide.

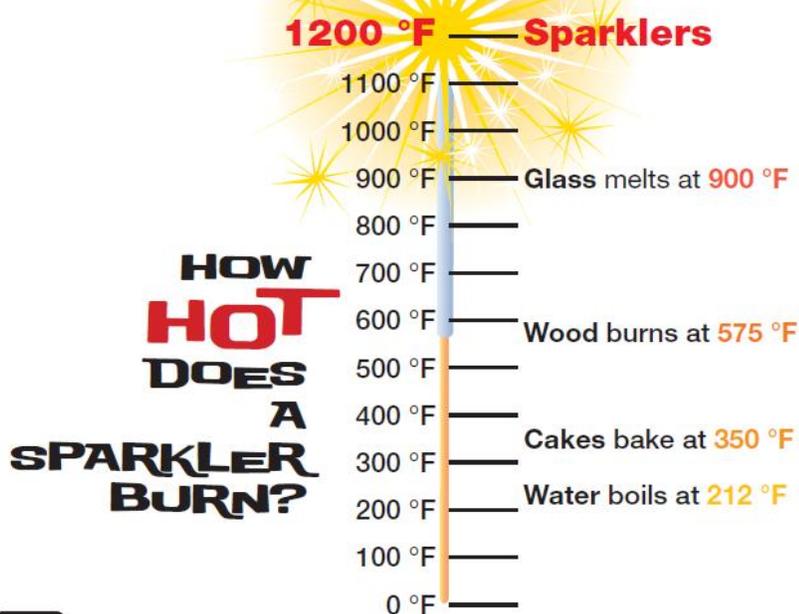
It is the hope of every encampment staff that encampment attendees enjoy their experience in a safe and healthy environment and manner.

# Fireworks Safety

Fireworks during the Fourth of July are as American as apple-pie, but did you know that more fires are reported on that day than on any other day of the year in the United States? Nearly half of these fires are caused by fireworks. The good news is you can enjoy your holiday and the fireworks, with just a few simple safety tips:

## PROCEED WITH CAUTION!

- »» Leave fireworks to the professionals. Do not use consumer fireworks.
- »» The safest way to enjoy fireworks is to attend a public display conducted by trained professionals.
- »» After the firework display, children should never pick up fireworks that may be left over, they may still be active.



## CONSUMER FIREWORKS

include sparklers and firecrackers. The tip of a sparkler burns at a temperature of more than **1,200 degrees Fahrenheit**, which is hot enough to cause third-degree burns.



## FACTS

- ! Each July Fourth, thousands of people, most often children and teens, are injured while using consumer fireworks.
- ! The risk of fireworks injury is more than twice as high for children ages 10–14 as for the general population.



Your Source for SAFETY Information

NFPA Public Education Division • 1 Batterymarch Park, Quincy, MA 02169

[www.nfpa.org/education](http://www.nfpa.org/education)

# Pool simple steps save lives

# SAFELY

## Simple Water Safety Steps Can Save Lives



Your greatest water safety assurance comes from adopting and practicing as many safety steps as possible. Adding an extra safety step around the water can make all the difference.

*You can never know which safety step will save a life — until it does.*

### Stay Close, Be Alert and Watch

- Always watch your children and never leave them unattended
- Keep children away from pool drains, pipes and other openings
- Have a phone close by at all times
- If a child is missing, check the pool first
- Share safety instructions with family, friends and neighbors

### Learn and Practice Water Safety Skills

- Learn to swim
- Know how to perform CPR on children and adults
- Understand the basics of life saving so that you can assist in a pool emergency

### Have the Appropriate Equipment

- Install a fence around the perimeter of the pool and spa of at least four feet in height
- Use self-closing and self-latching gates
- Ensure all pools and spas have compliant drain covers
- Install a door alarm from the house to the pool area
- Maintain pool and spa covers in working order
- Have life-saving equipment such as life rings or reaching poles available for use





*Pool Safely* is a national public education campaign to reduce child drownings, non-fatal submersions and entrapments in public swimming pools and spas. The campaign was developed by the U.S. Consumer Product Safety Commission (CPSC) to carry out the requirements of the *Virginia Graeme Baker Pool and Spa Safety Act (P&SS Act)*, federal legislation mandating new requirements for public pools and spas, including a public education campaign.

CPSC is working to ensure drowning and entrapment prevention become important public safety priorities by raising awareness, promoting industry compliance and improving safety at pools and spas. The *Pool Safely* campaign gives emphasis to an important and simple message: just adding an extra safety step in and around the water can make all the difference.

CPSC estimates that each year nearly 300 children younger than five drown in swimming pools and spas and more than 3,200 children that age go to hospital emergency rooms due to submersion injuries in pools and spas.

You and your family can *Pool Safely* by adopting extra safety steps:

- Practice supervision
- Install barriers
- Avoid entrapment
- Know life-saving skills

For more information and resources for pool and spa safety and the Pool and Spa Safety Act, visit:

[www.PoolSafely.gov](http://www.PoolSafely.gov)

Follow us on Twitter @poolsafely

See us @ [www.flickr.com/photos/poolsafely/](http://www.flickr.com/photos/poolsafely/)

Watch us @ [www.youtube.com/poolsafely](http://www.youtube.com/poolsafely)

*A public education campaign from the  
U.S. Consumer Product Safety Commission*



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Discover, report, stop, share, listen, and learn. The things we have read about in this issue already have happened, so you are not allowed to experience these for yourself.

Remember to "Knock It Off" and slow down. For streaming dialogues on some subjects, remember CAP Safety is on Facebook and Twitter.

## SUMMARY

CAP's safety awareness and program management has significantly improved with the addition of NHQ safety staff working in conjunction with the National Safety Team (NST). The NST is comprised of the National Safety Officer and volunteer assistants assigned as subject matter experts for flight and ground safety. Region and Wing Commanders are moving away from a punitive safety program towards a behavior-based safety program that has shown significant improvement in using safety mishaps as an educational opportunity to raise awareness and prevent risk exposure.

Got a great safety article that you would like to see in a future Beacon newsletter? Please send it to Lt Col Sharon Williams at [safetybeacon@capnhq.gov](mailto:safetybeacon@capnhq.gov).

# Region Safety Officers



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