

# Rocket Hazard Assessment for the Cirrus Airframe Parachute System<sup>®</sup> (CAPS<sup>®</sup>)

If you've read the manual on the Cirrus website it's possible you may have asked yourself: how do I apply all this in the real world? This article attempts to take the larger body of knowledge contained in the 1<sup>st</sup> Responder Information Manual ("Manual") located on the Cirrus Aircraft website (<http://firstresponder.cirrusaircraft.com/>) and boil it down in summary fashion into four basic questions that can aid you in making good decisions on an accident site with regards to the CAPS rocket. Please note, however, that this article, while helpful, does not contain the same level of detail or vast number of illustrations found in the Manual. First Responders should familiarize themselves with the full Manual and not rely solely on this summary document.

## **Question #1: Does the airplane you're dealing with have a Cirrus Airframe Parachute System (CAPS) or a ballistic parachute?**

If it is a Cirrus airplane the answer is ALWAYS yes. Every Cirrus airplane ever produced was equipped with the CAPS system. Keep in mind, however, that BRS, the company that invented the ballistic parachute system, has sold over 30,000 ballistic parachute units. As of this writing, there are only about 6,300 Cirrus planes out there. That means there are over 20,000 ultra-lights, light sport, and other certified aircraft with ballistic parachute systems installed. You can learn more about BRS ballistic parachutes on their website at [www.brsaerospace.com](http://www.brsaerospace.com).

On an accident site where you have identified that you are dealing with a Cirrus, immediately notify everyone on site that the CAPS hazard is present. Make time to minimize personnel present and back off any by-standers until you have answered the next three questions in this article. Ideally, you want a 1,000 foot safety zone if possible. The primary concern is the rocket becoming a projectile hazard due to activation by heat/flames or something disturbing the activation cable and setting off the rocket on the ground.

There have been several occasions where the fire has ignited and launched the rocket during firefighting operations. The rocket trajectory in such cases is completely unpredictable. If there is not a threat to life (someone in need of immediate rescue) or public safety, the safest course of action is to simply stay a safe distance away and allow the fire to burn itself out and cool completely.

## **Question #2: Is the parachute out of the airplane and visible on the ground?**

During the crash sequence the CAPS activation cable routing may become compromised to the extent that the cable is pulled until it fires the rocket even though the CAPS handle wasn't pulled by an occupant in the plane. If the rocket did fire, it will have attempted to pull the parachute from the airplane. The parachute can take on different visual appearances depending on how far the rocket was able to pull it from the airplane. Sometimes the rocket fires and the parachute remains trapped in the wreckage. Other times the packed parachute bag might get pulled out some but the parachute itself remains packed in its softcover, which looks like a large rectangular nylon pack with yellow harnesses attached between it and the airplane. In yet other circumstances, the orange and white canopy is plainly visible. On rare occasions, the parachute has been pulled out

of the airplane during the crash sequence even though the rocket did not fire. Bottom line – if the parachute is out of the airplane it is highly probable that the rocket is expended.

So if the parachute is out that is good news, but don't let your guard down. Try to verify that the rocket is NOT in the launch tube. As long as the rocket is out of its launch tube and out of the airplane, it is reasonably safe, barring other hazards, to proceed.

When the parachute is out on the ground don't forget that you **MUST CONTAIN IT IMMEDIATELY**. It has just become your new number one priority. The parachute has the ability to lift the airplane and drag it given certain wind conditions. If you are leaning through a door or handling any of its suspension lines, risers, or harnesses and the parachute goes taught from a gust of wind, you can be severely injured by the lines as they come in contact with you and the airplane. If the chute starts to pull the plane across the ground anyone nearby or downwind is now in danger of being run over by a driverless 2,500 pound (or more) vehicle. Roll the parachute up and stow it or park a truck on it. If it is inflated, hose it down with a fire hose to deflate it.

### **Question #3: Is the airplane intact?**

The condition of the airplane is critical to deciding the appropriate actions to take. An intact airplane is one where the fuselage (main body) of the airplane is not damaged. All the windows and doors should be present. The doors should open and close without binding. The empennage (tail) of the airplane should be relatively intact without major damage or deformation.

The reason for determining if the airplane is intact or not is to assess whether the CAPS activation cable has been compromised. If the airplane is not intact and the activation cable is compromised, movement of the wreckage while extricating occupants or tending to the scene could cause the rocket to activate **EVEN WITH THE SAFETY PIN IN**, because jostling of the activation cable could cause it to fire the rocket.

For an intact airplane simply put the safety pin in the activation handle holder or zip tie activation handle to prevent accidental activation. Essentially you are performing the same safety procedure as the pilot after parking his airplane.

If the airplane is not intact and there is any appearance of damage to the activation cable routing, it is in everyone's best interest to use a proper cable cutter to cut the activation cable as close to the igniter (ignition source/switch) as possible. Detailed instructions on performing this task can be found in the 1<sup>st</sup> Responder Information Manual at <http://firstresponder.cirrusaircraft.com/>. Be sure to wear your full turn-out gear for protection (helmet, face shield, outerwear and gloves). Again, personnel present should be minimized and a 1,000 foot safety zone established if possible. Cutting the activation cable does NOT disarm the system, but it does reduce the likelihood that movement of the damaged fuselage will result in an activation. Use PROPER cable cutters. Use of bolt cutters, side cutters, or other non-cable cutting tools is not an option as they may move the activation cable during the cutting process and launch the rocket. Once the activation cable has been cut, the airplane is substantially safer to work around. Now the wreckage can be moved a short distance to open critical runways.

#### **Question #4: Where is the rocket?**

##### Rocket IN the Launch Tube

If you find the rocket in the launch tube use the advice just covered in Question #3 to navigate your next steps. Everything depends on whether or not the airplane is intact or not at this point.

##### Rocket OUT of the Launch Tube

Cirrus propeller driven airplanes have two basic types of CAPS: percussion ignition and electric ignition systems. The percussion system ignites the rocket from the bottom using black powder and magnesium set off by primers similar to a primer in a bullet or a shotgun shell. The electric system uses an igniter in the top of the rocket (look for the wires coming out the top). Both systems utilize a virtually identical mechanical cable activation system. Cutting the cable near the igniter/switch remains the same for both systems.

What does all this have to do with whether the rocket is out of the launch tube?

In percussion systems, if the rocket tumbles free of the airplane during a crash it has been separated from its ignition source. As long as no heat or fire come near the rocket, it is very safe. Within reason, the rocket from a percussion ignition system should no longer pose a threat as long as heat and flame don't come near it. Mark it, avoid it, and keep the site secured until a qualified technician can come render it inert.

In an electrical ignition systems, when the rocket tumbles free onto the ground it is likely the frangible link will be broken or severed. The frangible link is a perforated circuit card which connects the igniter on the top of the rocket to the airplane's electrical system. It is designed to break when the rocket launches and departs the airplane. If the rocket were to tumble free, the frangible link will have broken the same as if the rocket had been launched. Now you have a rocket AND an igniter lying on the ground as one, but there is no electrical power hooked to it. As long as you keep fire and heat away from the rocket and igniter they can no longer be activated by movement of the wreckage or the activation cable. As an additional safety measure, take the two wires coming out of the igniter and "shunt" them together – meaning to bare the ends of the wires and twist them together to close the circuit. This should prevent any stray voltages from setting off the igniter. Again – mark the location of the rocket, don't let anyone handle it, and keep it secured until a qualified technician can come render it inert.

Sometimes the question is posed as to whether radio signals can set off the electrical igniter. While technically possible, the system isn't sensitive to normal everyday communication devices. Thus, you don't have to try and shut down your communications network, but if you happen to venture onto a military base or telecommunications antenna farm, then you may want to consider this hazard.

##### Cannot find the Rocket

Sometimes during an impact the rocket fires and flies away. If you cannot locate the rocket initially, remain vigilant as it may be found in the debris field at a later time. As long as it is not in the launch tube and connected to the activation cable and/or electrical system, the rocket poses a minimal threat as long as it does not become exposed to fire or heat.

## Summary

The 1<sup>st</sup> Responder Information Manual is populated with lots of pictures and more details of everything just talked about. Asking yourself the four questions discussed in the order presented should aid you in making the proper decisions regarding the rocket in a Cirrus Airframe Parachute System. If you are more visually oriented, the following page has a flow chart that might also be found helpful.

Stay safe and thank you for what you do!

Four basic questions:

### **Question #1: Does the airplane you're dealing with have a Cirrus Airframe Parachute System (CAPS) or a ballistic parachute system?**

All Cirrus have CAPS®

Many planes have ballistic parachute systems

### **Question #2: Is the parachute out of the airplane and visible on the ground?**

If yes –

- High probability rocket is expended
- Contain it immediately so it doesn't inflate!!!

### **Question #3: Is the airplane intact?**

Yes – SECURE by putting safety pin in activation handle

No – DISABLE by cutting activation cable with proper cable cutters near the igniter

### **Question #4: Where is the rocket?**

In launch tube: Possible Danger – use information from question #3

Out of launch tube separated from the plane: Rocket Safer – mark location, keep safe, have technician render inert

Unknown: Remain vigilant, ensure everyone on site knows about hazard(s) present

