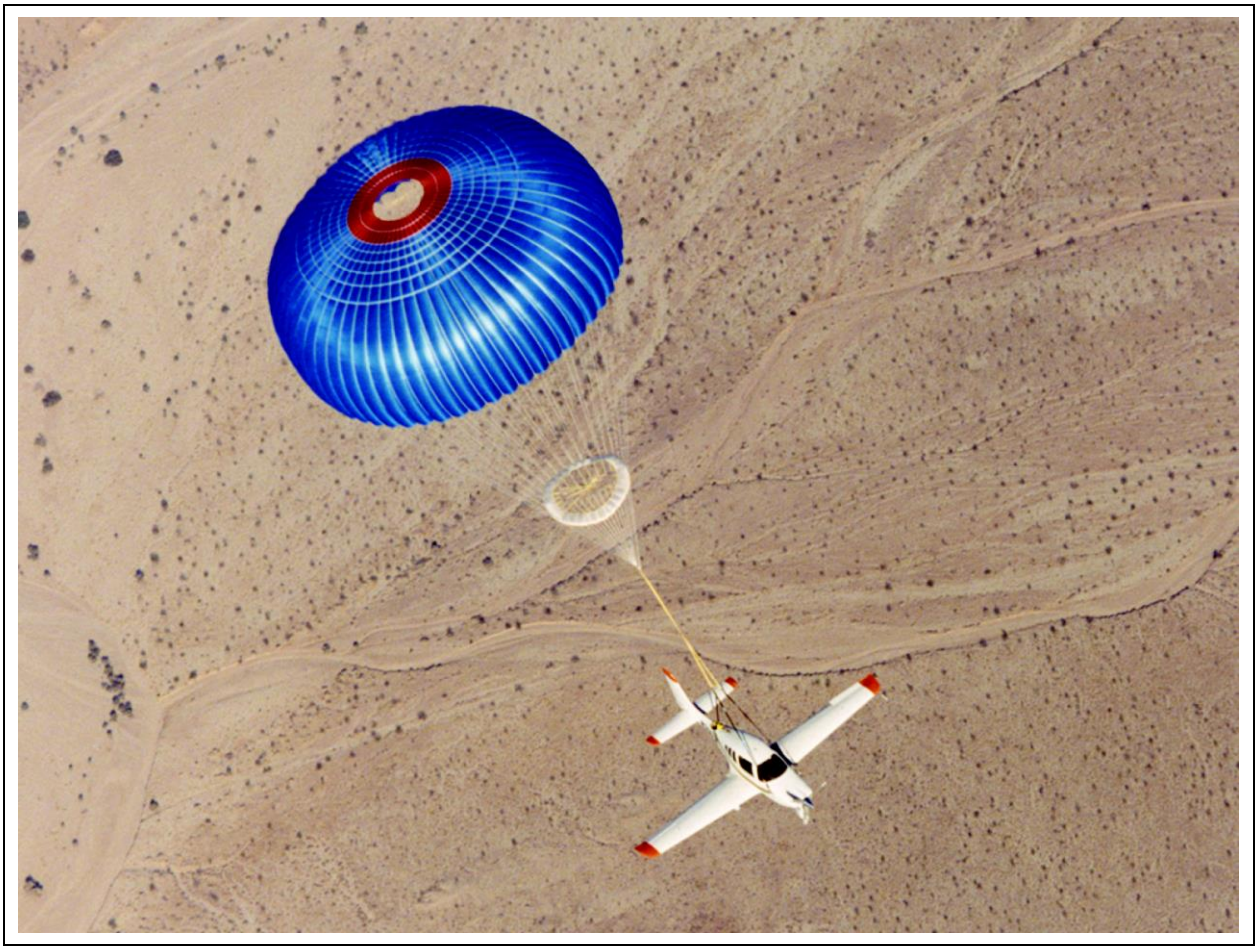
CIRRUS 1ST RESPONDER INFORMATION MANUAL



Date: July 23, 2018
Revision: 2

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PREFACE

This document has been assembled with first responders as its target audience. The intent is to inform first responders of the potential hazards they may encounter when working on or around a Cirrus airplane at an accident site. Special emphasis is placed on the Cirrus Airframe Parachute System (CAPS). While all the situations faced at an accident site cannot be foreseen or predicted, experience has shown that training and prior knowledge is the best way to stay safe.

Cirrus has contributed considerable time and resources to educate first responders and others on airframe parachutes systems. That said it is impossible for Cirrus to educate every first responder in the world. We ask that you pass on this document and any knowledge gained to as many people possible if the information will benefit their safety. To aid in this effort we have created a website with a safety video and other pertinent information.

Please visit:

http://firstresponder.cirrusaircraft.com/

Username: cirrus (case sensitive)
Password: CAPS (case sensitive)

The Cirrus Air Safety Department is manned 24/7 to respond to emergencies. If you are on an accident site and need an answer right that minute don't hesitate to call. If you have a general knowledge question feel free to contact us during the week during normal business hours.

Hot Line 24/7:

1-800-279-4322

International: 218-474-1028 / 218-310-0567

During normal business:

Email: Airsafety@cirrusaircraft.com

Phone: 218-788-3400

Cirrus Airframe Parachute System

The Cirrus Airframe Parachute System or “CAPS” is a safety system that utilizes an airframe parachute system. When CAPS is activated by the pilot, a rocket extracts a parachute very quickly (less than 2 seconds). The parachute will then inflate and lower the entire aircraft and its occupants to the ground. The system is used for in-flight emergencies such as pilot incapacitation, mid-air collision, loss of control, structural failure and other situations the pilot deems necessary.

Similar systems are widely used in ultra lights and light sport airplanes. They are also becoming more common on other general aviation aircraft. Currently there are roughly 5,300 Cirrus airplanes utilizing CAPS. BRS, the most common brand currently found in the United States, claims to have sold over 30,000 parachute systems according to their website.

SECTION 1

IDENTIFYING CAPS COMPONENTS

IDENTIFY & NOTIFY

It is imperative that the presence of an airframe parachute system be identified as early as possible when responding to an aviation mishap. Once it is determined that an airframe parachute system is present, it is vital to communicate to all personnel on the accident site that there is a potential hazard and to take appropriate precautions. Remember: ALL Cirrus airplanes are equipped with an airframe parachute system called CAPS.

It is highly recommended that Cirrus Aircraft be notified as soon as possible after a mishap involving a Cirrus airplane. Cirrus Aircraft trained technicians are available to respond 24/7.

While the methods outlined in this document will assist the first responder in making the CAPS “safer” for the rescue of occupants or to facilitate moving wreckage in a timely manner, it does not detail the final disarming of the system which requires special training and tools. In certain circumstances it may be advisable to secure an accident site and have a Cirrus trained technician come and disable or disarm the system prior to proceeding with recovery efforts. This will be discussed in more detail later in this document.

The sooner the Cirrus Aircraft Air Safety Department is notified, the sooner a technician can be on-site or appropriate arrangements made for the final disposition of the CAPS.

At any time there are questions or concerns CALL a Cirrus Air Safety Representative immediately.

Hot Line 24/7:

1-800-279-4322

International: 218-474-1028 / 218-310-0567

During normal business:

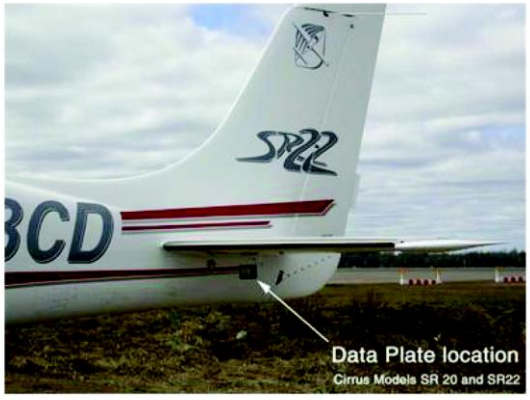
Email: Airsafety@cirrusaircraft.com

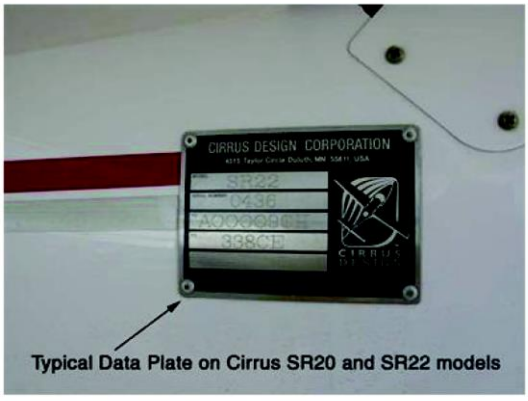
Phone: 218-788-3400

IDENTIFYING CIRRUS AIRPLANES

The photo below is to aid you in the identification of Cirrus airplanes.

If the airplane make and model is not readily identifiable you may be able to confirm the model of the airplane by locating the data plate located near the "tail" of the airplane. See photo. Another method is to use the airplane registration number (N-number) and either have the FAA tell you the model of airplane or to look it up yourself at http://registry.faa.gov/aircraftinquiry/ on the FAA's website.





ACTIVATION HANDLE & CABLE

Activation Handle

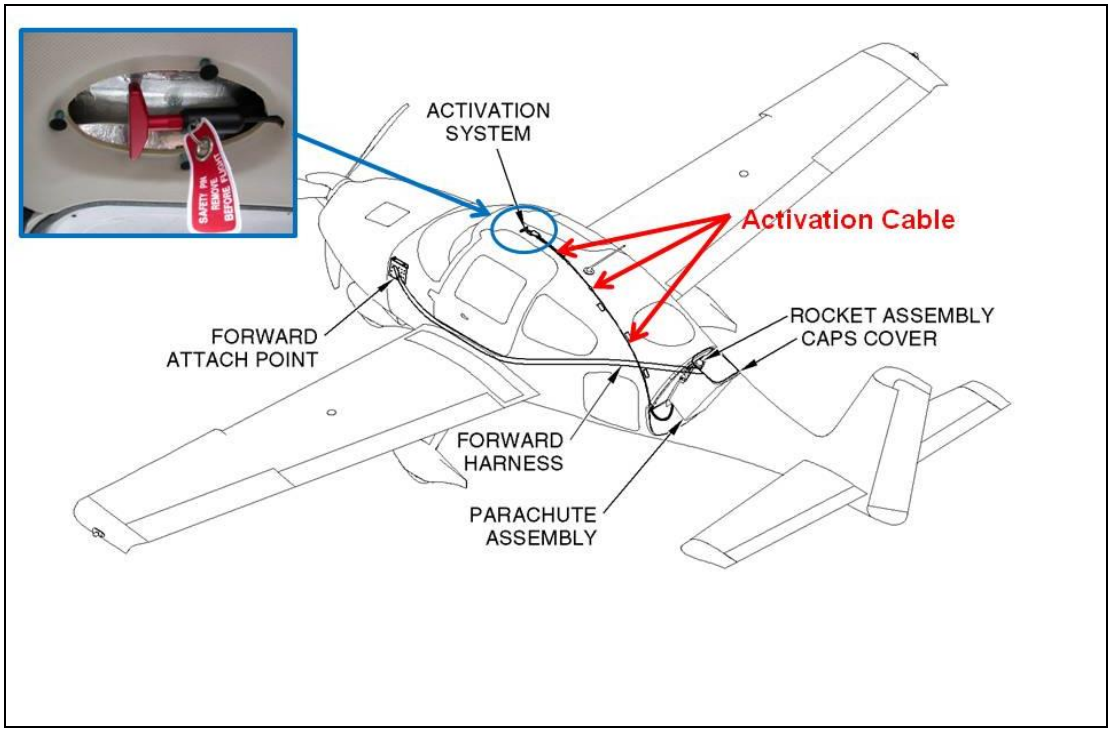
The CAPS Activation Handle is a red anodized “T-Handle” installed in a recess in the cabin ceiling between the two front seats. It has a safety pin which is removed before flight and re-installed after each flight. The handle is normally covered with a black plastic cover with instructions for it use on it.

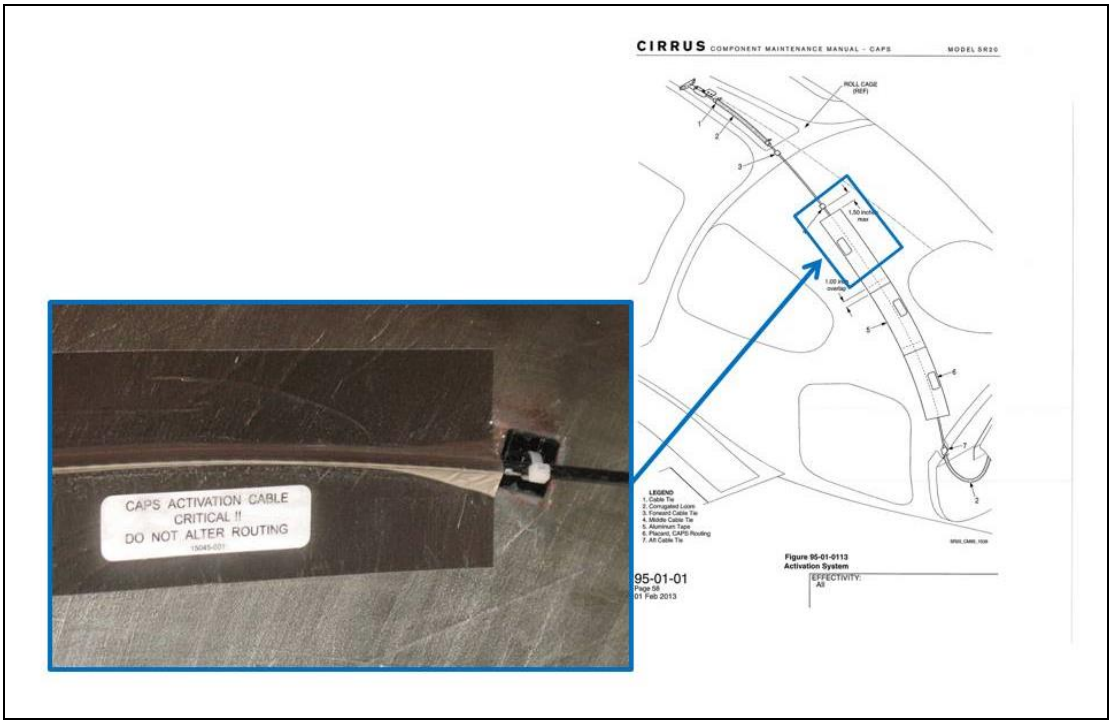
Activation Cable

The Activation Cable looks very similar to a hand brake cable on a bicycle. The outer housing is black.

Activation Cable Location

The activation cable is adhered to the fuselage of the airplane using a zip tie anchors and foil tape with warning placards. The cable is routed through the back wall of the baggage compartment to the rocket igniter assembly.





ROCKET MOTOR

Rocket Motor

The rocket motor comes in several different sizes and colors depending on the model and age of the airplane. Cirrus rocket motors are cylindrical in shape and are comprised of red or yellow anodized aluminum housings. Sizes range from roughly 7-10 inches long and 2-3 inches in diameter.

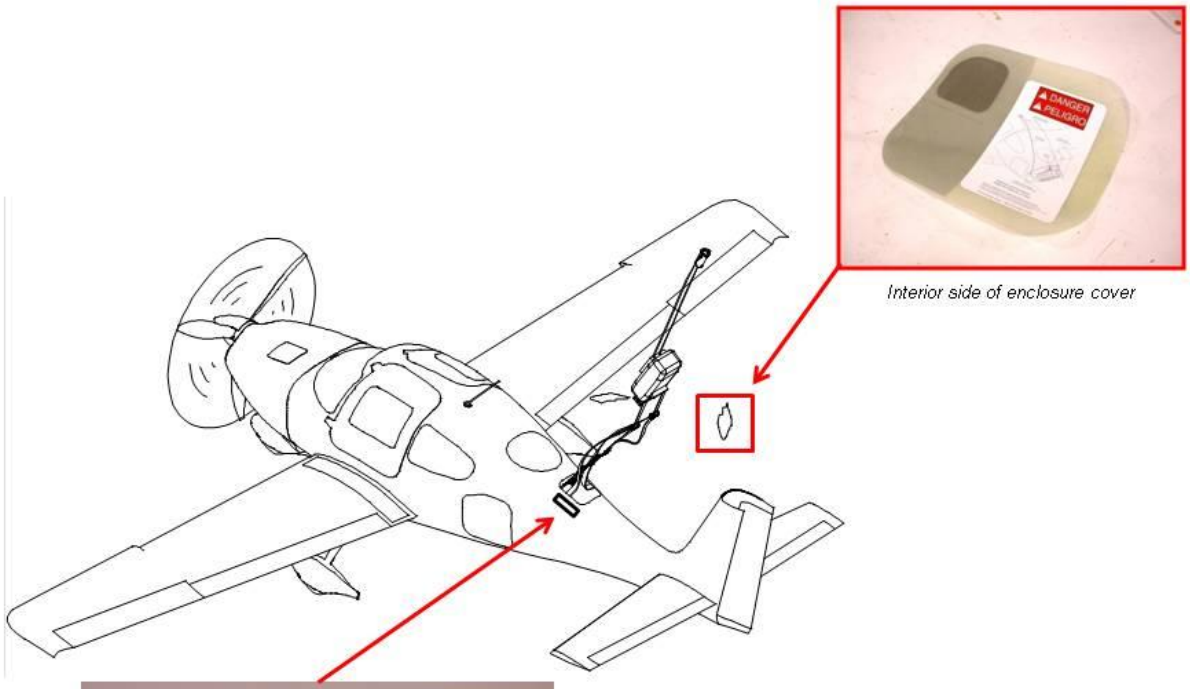
There are two types of rocket motors. One utilizes a percussion igniter system and the other uses an electrically fired igniter. In the photos below the electrically fired rockets have the silver cylindrical shaped assembly on top with wires coming out.

PARACHUTE ENCLOSURE COVER

The Parachute Enclosure Cover

The parachute enclosure cover is a breakaway panel that comes off when the rocket is launched and the parachute is extracted. The parachute enclosure cover is roughly 14” x 16”.

On a fully functional Cirrus, say one parked at your local airport, the enclosure cover is not visible as it is painted over and seamless. There are two warning placards, one on each side of the airplane, that denote where the cover is.



Interior side of enclosure cover

Placard on exterior of airplane – one on each side

PARACHUTE

Parachute

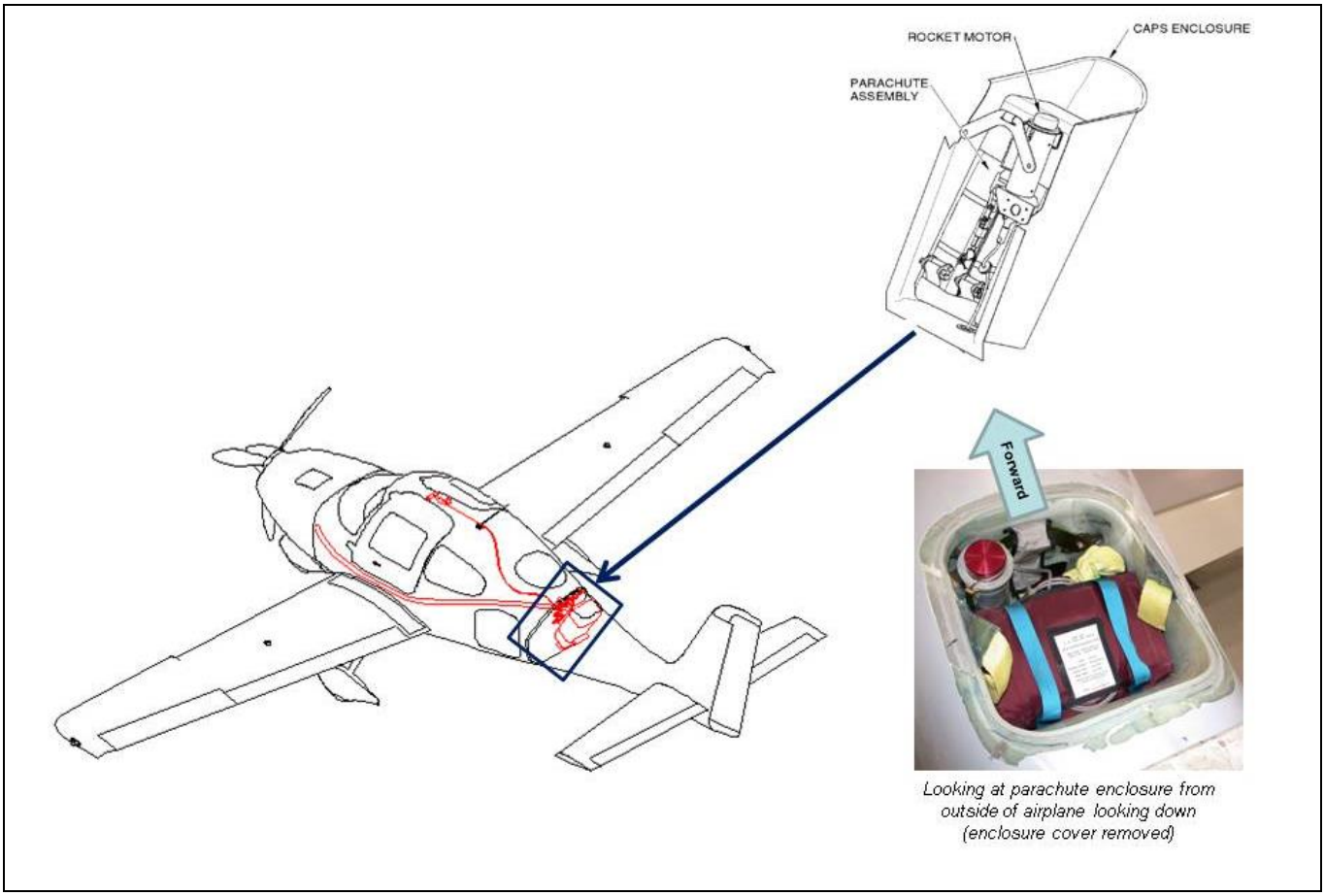
The CAPS uses a large diameter parachute (55 feet or more). The risers and attachment harnesses are made of Kevlar, the largest of which, are load rated to 20,000 pounds or more. The parachute is packaged into a deployment bag which is stowed in the parachute enclosure located behind the aft wall of the cockpit / baggage area of the airplane.

The rocket pulls the parachute free of the airplane by exiting the parachute enclosure through a break-away panel (parachute enclosure cover) located just aft of the rear window atop of the airplane. The harnesses that attach the parachute to the airplane are imbedded in storage channels located behind break-away covers along the sides and under the doors of the airplane leading up to side attachment points located near the firewall of the airplane just aft of the engine (see rocket motor and parachute location).

The parachute is white and orange, but will look different if it is still in its deployment bag. Deployment bags vary in color (red, black, white, maroon). When packed in the deployment bag the rough dimensions are about 2' x 1' x 8".

Rocket Motor & Parachute Location

The rocket motor and parachute are located in the CAPS Enclosure behind the back wall of the airplane behind the baggage compartment.



Looking at parachute enclosure from outside of airplane looking down (enclosure cover removed)

PLACARDS

Placards

There are a number of warning placards on the airplane.

There are two placards on either side of the exterior of the Parachute Enclosure Cover. The Parachute Enclosure Cover frequently is dislodged in accidents so a larger placard is also affixed to its interior side.

The rocket motor has also been known to become separated from its launch tube during an accident so it has a placard on its top.

There is also a large placard on the access panel on the back wall of the airplane (behind the carpeting) which warns anyone attempting to gain access that the rocket motor is present.

Exterior placard

Rocket Motor Placard

Access Panel Placard

Parachute Enclosure Cover (interior side) Placard

SECTION 2

CAPS HAZARDS

The following descriptions are informational in nature and are intended to make 1st responders aware of the hazards.

They are NOT intended to be used as guidelines for field disarming or disposal of the hazards by untrained personnel. Attempting to disarm or dispose of these items may cause serious injury and/or death.

Additionally, valuable evidence could be compromised that could be documented by trained investigative personnel.

ACTIVATION HANDLE & CABLE HAZARDS

Movement of Wreckage Causing the System to Fire

The rocket is launched utilizing a mechanically activated ignition system. Slack is built into the activation cable run to prevent inadvertent firing of the system. Damage to the airplane during an accident could cause the system to launch the rocket on impact.

If the rocket did NOT fire during impact (or prior), it is possible that crash damage to the airplane could alter or stretch the activation cable. If the activation cable becomes altered or stretched it is possible that **movement of the airplane or wreckage after the accident could fire the rocket.** In this situation, the system is capable of firing with the safety pin in the activation handle.

DO NOT CLIMB ON OR MOVE THE WRECKAGE UNTIL YOU KNOW THE STATUS OF THE ACTIVATION SYSTEM AND ROCKET!

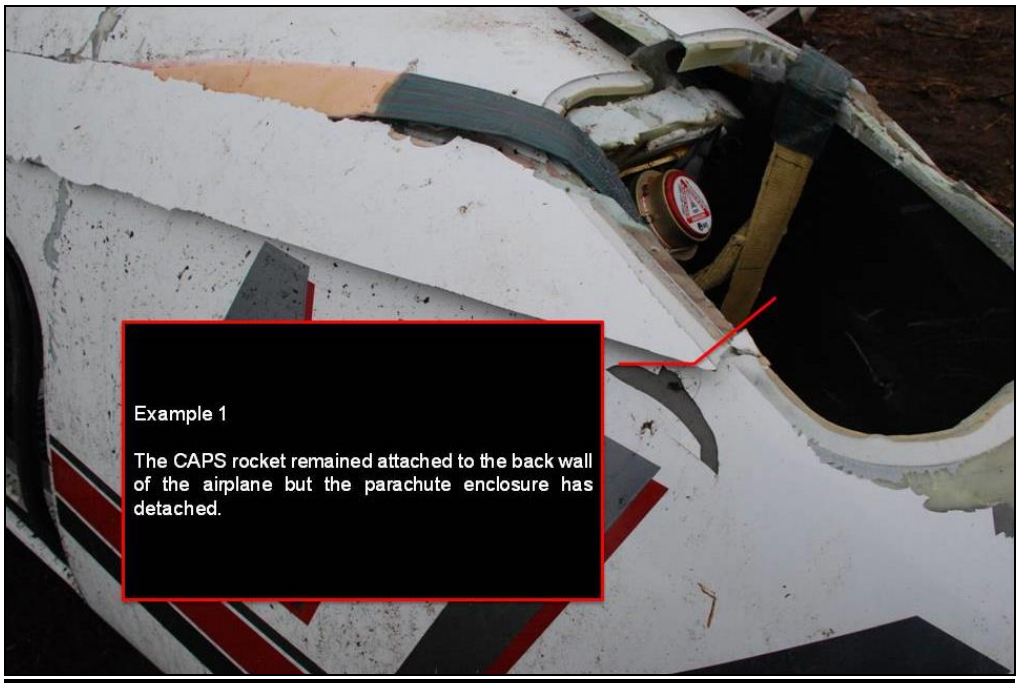
The system MUST BE DISABLED in order to make it safer to work around.

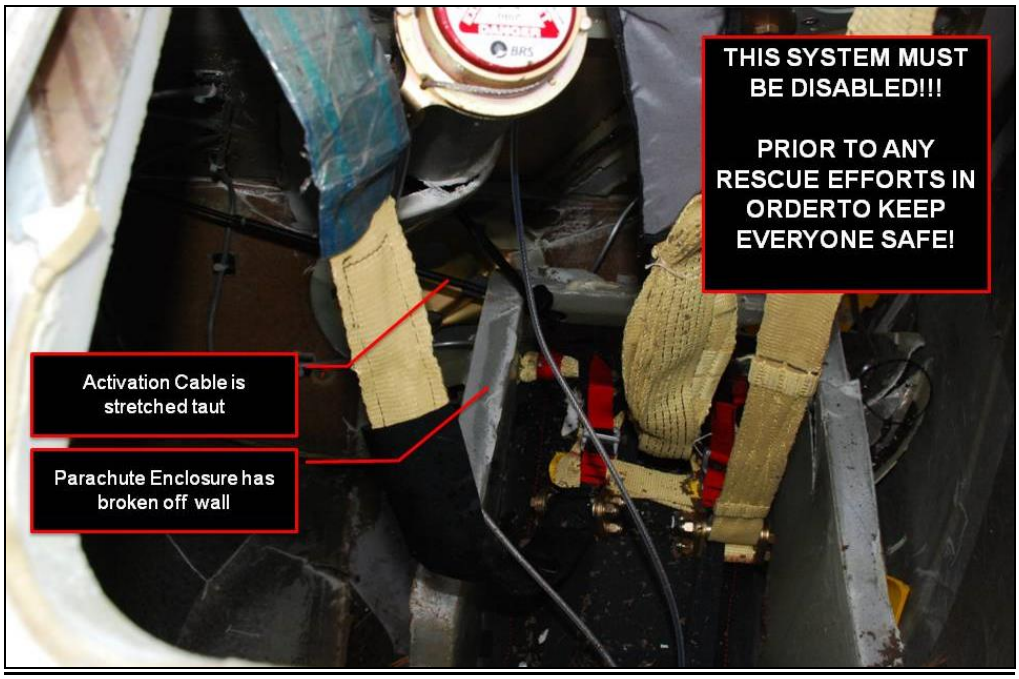
Disabling the system is discussed later in this document.

Movement of the wreckage underwater applies to this hazard as well. The system may be capable of firing even after prolonged immersion in water.

ACTIVATION HANDLE & CABLE HAZARDS

The following photos show an accident in which the activation cable was altered and stretched. First responders must be vigilant in determining if the activation cable routing has been altered or stretched PRIOR to working on or around the accident site.





ACTIVATION HANDLE & CABLE HAZARDS

The photo below is of similar but different accident involving a altered and stretched activation cable.

ACTIVATION HANDLE & CABLE HAZARDS

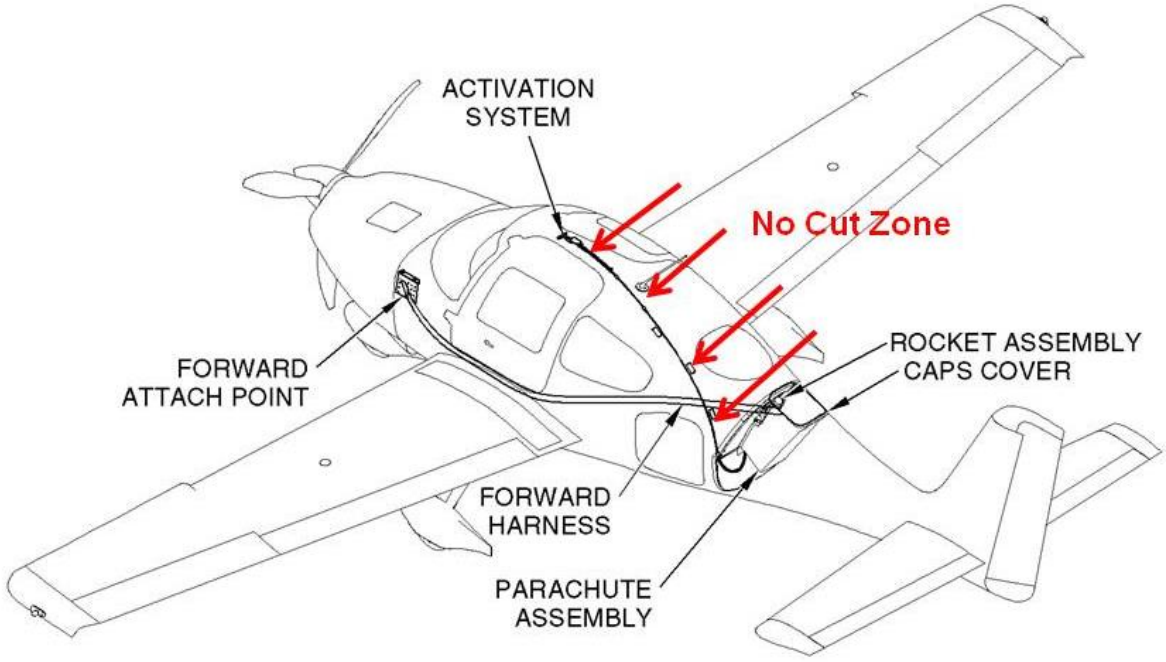
Occupant Extrication Using Jaws of Life or Cutting Tools

In past events involving Cirrus airplanes, occupant extraction has been accomplished by:

- Prying the doors off the airplane
- Cutting the A-pillars
- Folding the roof of the cockpit back
- Cutting the roof free completely.

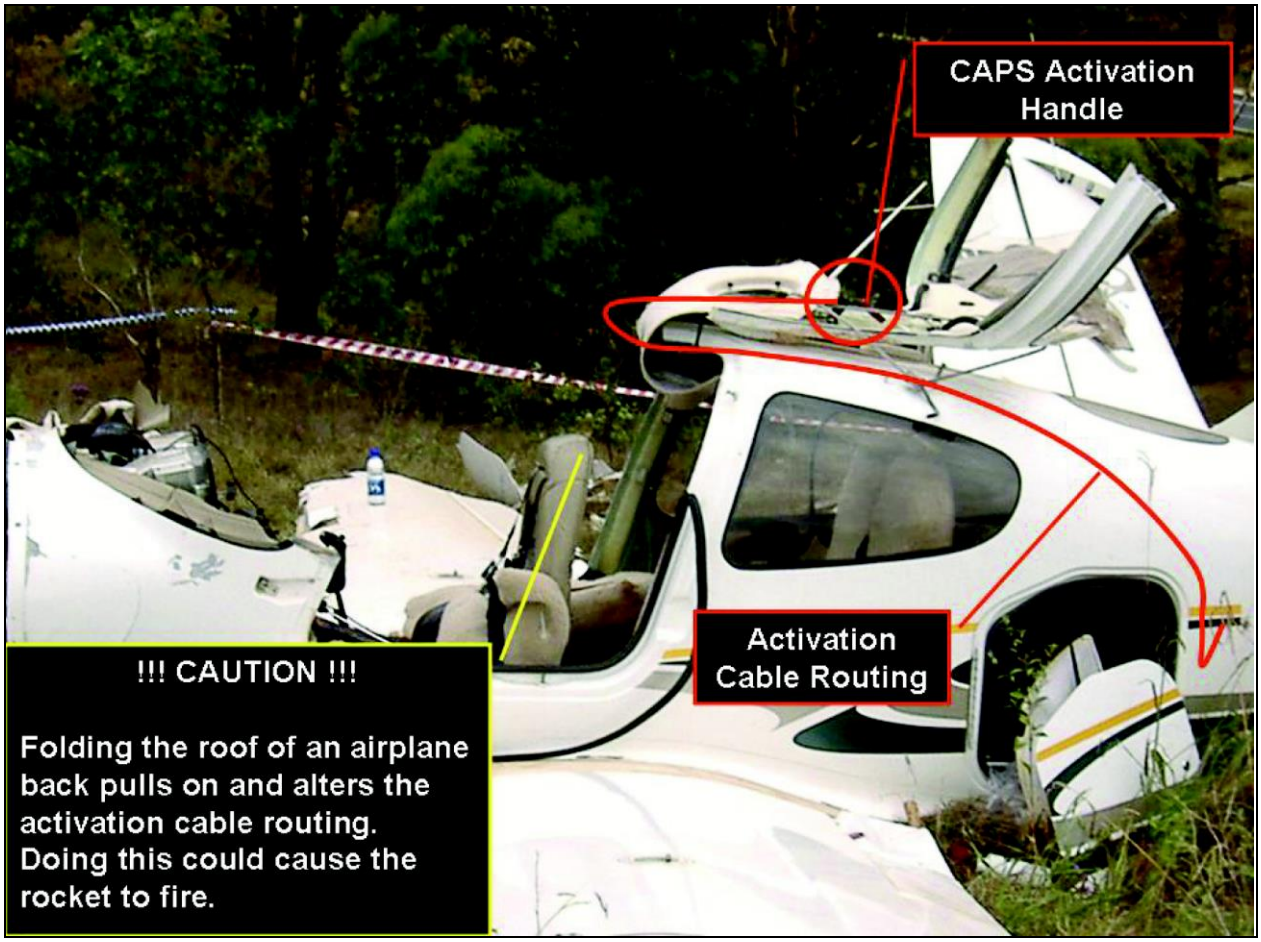
First responder must not cut or pry along the activation cable routing in order to avoid altering or stretching the cable which could launch the rocket or fire the igniter assembly.

Use caution when using prying or using cutting tools near the activation cable!



ACTIVATION HANDLE & CABLE HAZARDS

In this example the A-pillars were cut to fold the roof of the airplane back to facilitate easier access to the occupants. If the activation cable had not been properly “DISABLED” prior to doing this, the system could have fired the rocket. Disabling the activation system is discussed later in this document.



ROCKET MOTOR HAZARDS

Projectile Hazard

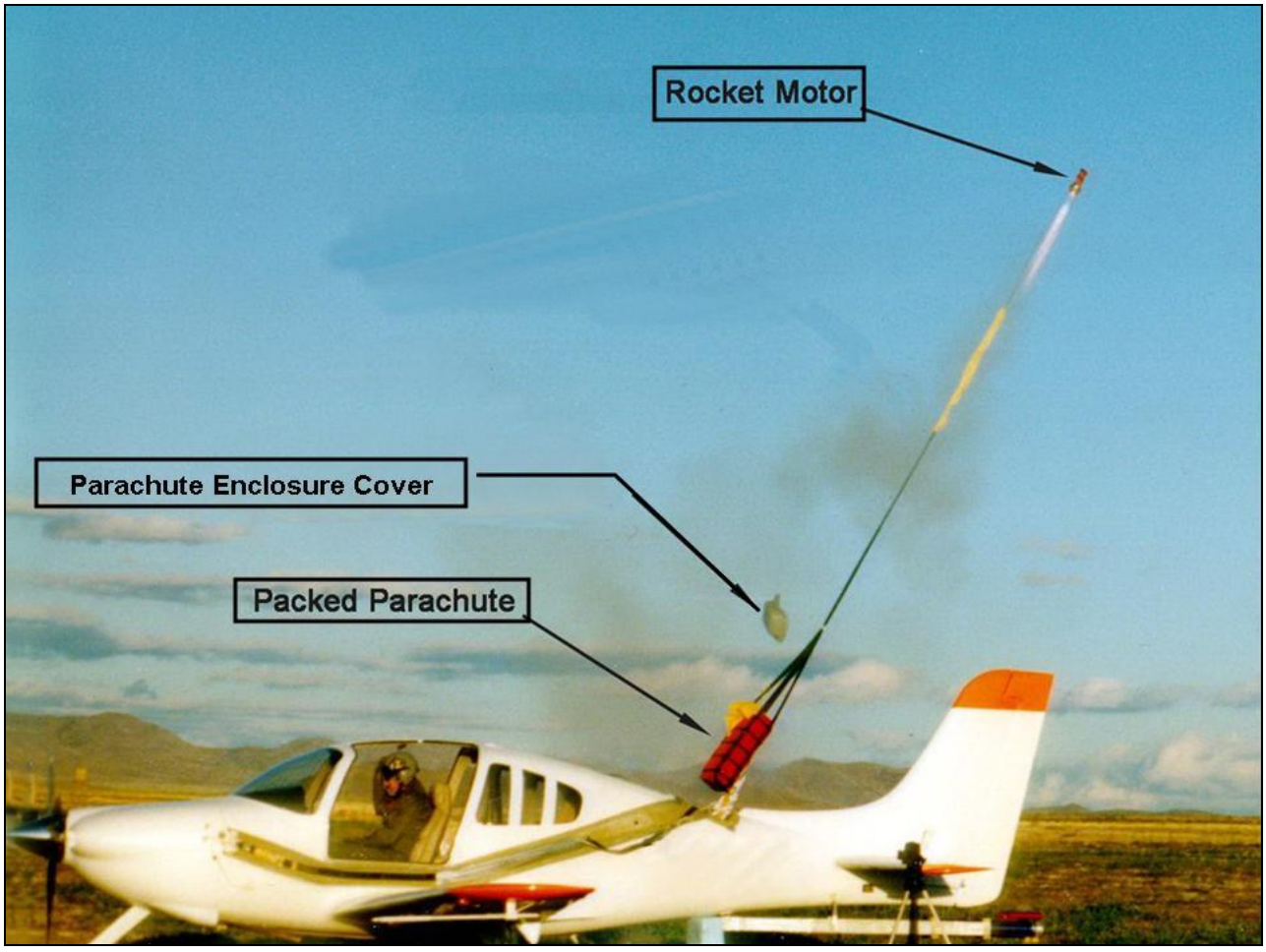
The rocket weighs roughly 2-3 pounds. The total firing period of the rocket motor is approximately 1.5 seconds. During this time, the rocket motor accelerates to over 100 mph in the first tenth of a second, making it a projectile hazard to anyone in its path.

Normal trajectory of the rocket is upward over the tail (vertical stabilizer) of the airplane.

Damage to the airplane and nearby obstacles to the flight path can cause the flight trajectory of the rocket to become COMPLETELY UNPREDICTABLE.

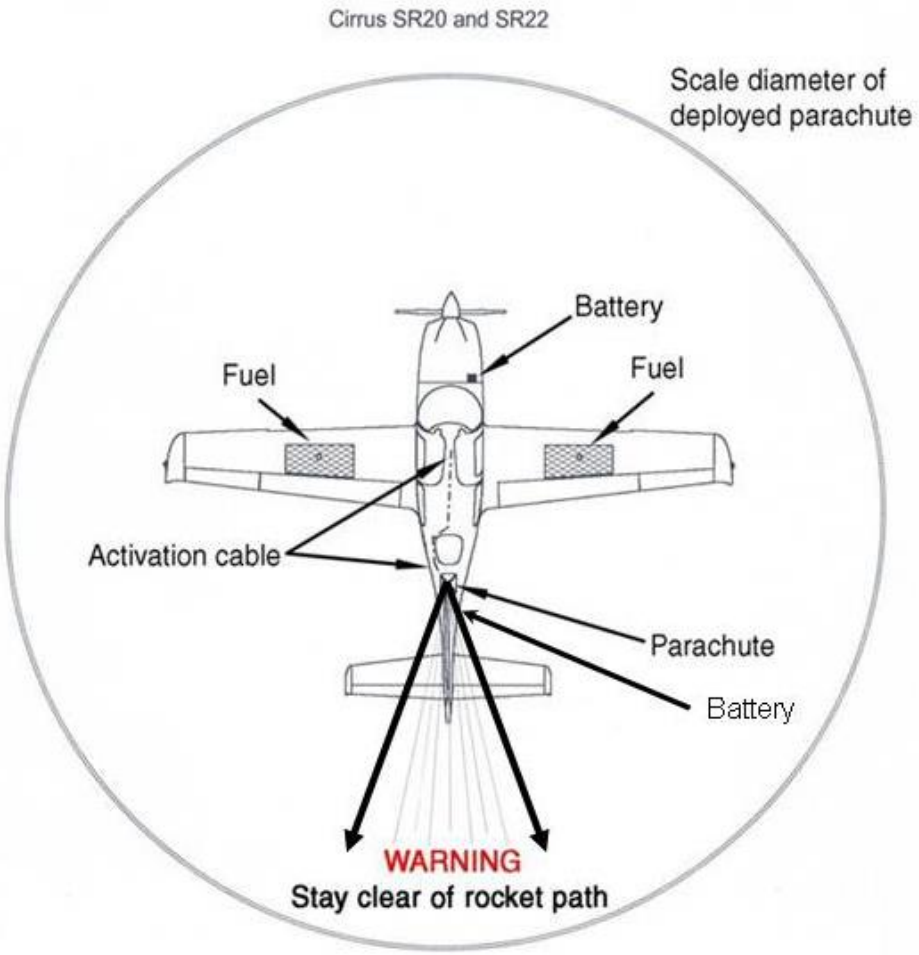
Until the system has been DISABLED or the location of the rocket identified, full fire fighter bunker gear is recommended. Non-essential personnel should be kept 1000 feet back from the accident site to prevent injury.

The photo below is representative of a “normal trajectory.”



ROCKET MOTOR HAZARDS

Until the accident site is assessed, it is recommended that the airplane be approached from the front and sides.



ROCKET MOTOR HAZARDS

Rocket Launch After the Accident

The rocket motor can be launched if the activation cable is disturbed as described previously.

Fire and/or heat can cause the rocket to launch making it a projectile hazard. In some cases the rocket assembly survives the impact and the igniter and rocket motor are set off by the post-impact fire.

In other cases the rocket may have tumbled free of the igniter assembly during the crash. When this happens the fire (or heat) will light off the rocket and igniter separately or one and not the other.

Where the rocket motor will fly is completely unknown in such instances.

It is recommended non-essential personnel be kept at the minimum safe distance of 1000 feet or greater. Personnel directly involved in the rescue of occupants or firefighting are recommended to use full bunker gear / safety equipment.

If a post-impact fire poses no threat to life and collateral damage is not a concern, it may be safer to let the fire burn itself out while monitored from a safe distance.

Finding a rocket motor lying near where fire has occurred previously does not guarantee that the rocket is expended.

A post accident rocket launch could potentially act as an ignition source for any flammable vapors present. The photo below shows a rocket motor from a percussion ignition system that tumbled free of the airplane during a crash. The fire after the crash never set the rocket off. **The photo shows a live rocket motor**.

Separated from its igniter and with no fire present it is recommended that: first responders mark the location of the rocket; don't move it; and contact Cirrus to have trained personnel come to the site and render the rocket motor inert.

Because the rocket from the percussion ignition system is no longer connected to an ignition source and no fire is present it will not launch unless it is exposed to fire or extreme heat.

ROCKET MOTOR HAZARDS

Explosive Potential

A rocket motor has the potential to explode if the propellant grains inside the motor were to become fractured, cracked or heat soaked. The system is purpose built to be resistant to fractures or cracks. However, the forces in a crash could exceed the propellant's ability to remain intact. Should this occur the surface area of the propellant would increase; and if ignited, the size of the exhaust nozzle on the rocket motor would not be sufficient to exhaust the gases produced, causing the rocket motor to burst or explode. It is for this is the reason; **the activation handle should NEVER be pulled following an accident to fire the rocket.**

NEVER PULL THE ACTIVATION HANDLE AFTER AN ACCIDENT!

Cirrus is aware of one accident in a ten year span in which evidence showed the rocket motor clearly exploded during the impact or very shortly after. Whether this occurred from a fractured grain or due to extreme heat and pressures from the post impact fire is unknown. Regardless, first responders MUST BE AWARE of the potential hazard the system imposes.

IGNITER & BASE HAZARDS (PERCUSSION FIRED SYSTEM)

IGNITER AND BASE ASSEMBLIES

There are two types of ignition systems for the CAPS – percussion and electric.

Percussion Ignition System

In the percussion fired ignition system the rocket motor is mounted in a launch tube on top of a rocket motor base and an igniter assembly. The igniter assembly contains two primers and dual firing trains containing black powder and magnesium. The rocket motor base is mounted atop the igniter assembly and contains a secondary booster charge of black powder and magnesium.

When the activation cable moves the plunger approximately ½ inch, a spring compresses and two ball bearings fall free of the plunger and igniter body allowing the plunger to move rapidly opposite the direction of the activation cable, the plunger then makes contact with the firing pins, which in turn strike the primers, firing the system.

Rocket In Launch Tube

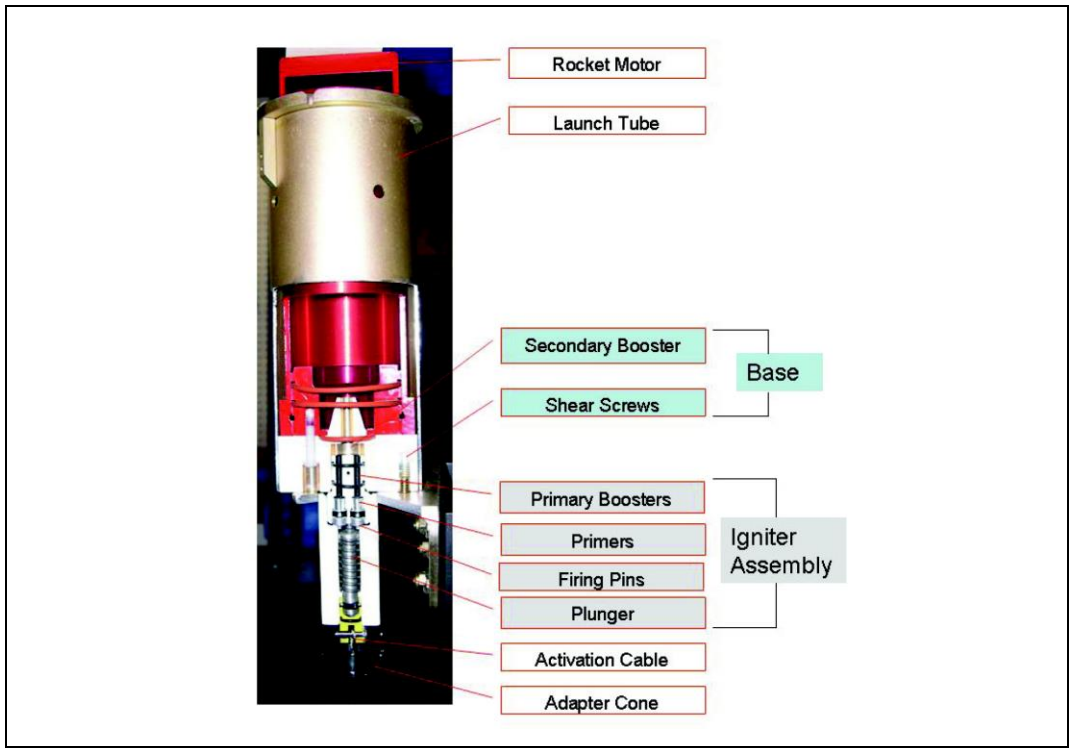
Firing the igniter **with the rocket present** will result in a rocket launch. Depending on damage present the rocket trajectory could be completely unpredictable. The explosive hazards associated with cracked propellant grains also apply. Ensure only essential personnel are present while disabling the system and keep non-essential personnel at a minimum 1,000 foot distance. It is recommended that essential personnel wear full fire-fighter bunker / turnout gear to include a face shield and helmet.

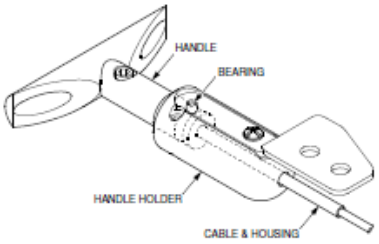
Rocket Not In Launch Tube

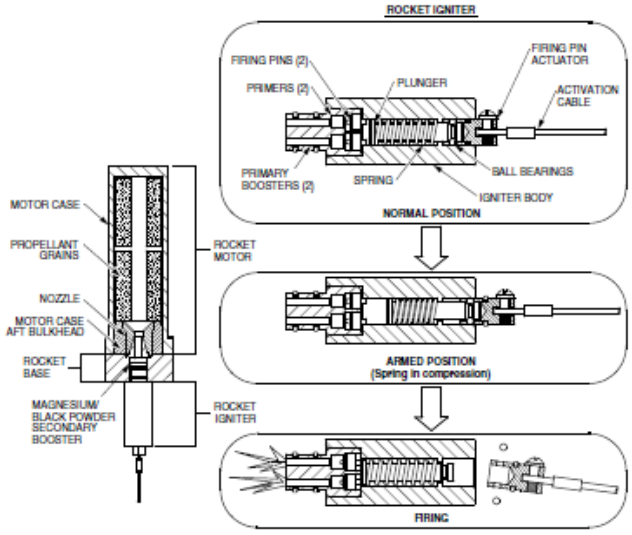
Firing the igniter assembly with the base attached and **without the rocket present** produces a flame of 6-12 inches and a report similar to a large caliber handgun. These components should be treated with caution as there is a possibility of blast debris in the direction of the firing train exit path, as well as producing an ignition source for any flammables present.

IGNITER & BASE HAZARDS (PERCUSSION FIRED SYSTEM)

Percussion Ignition System







IGNITER & BASE HAZARDS (ELECTRICALLY FIRED)

Electric Ignition System

The rocket motor is mounted in a launch tube on top of a rocket motor base. This base does not contain a secondary booster charge. An electric igniter is affixed to the top of the rocket motor case. The mechanics of the igniter switch are nearly identical to the percussion igniter except that the primers have been replaced with electrical contacts and the plunger closes the circuit causing the igniter on top of the rocket to fire. A frangible link (small piece of perforated circuit card) connects the rocket motor and igniter to the firing circuit / igniter switch. The frangible link breaks once the rocket fires and departs the airplane.

Rocket In Launch Tube

If the rocket remains in the launch tube be aware of the activation cable hazards and DISABLE the system. The system should be DISABLED prior to rescuing occupants if possible.

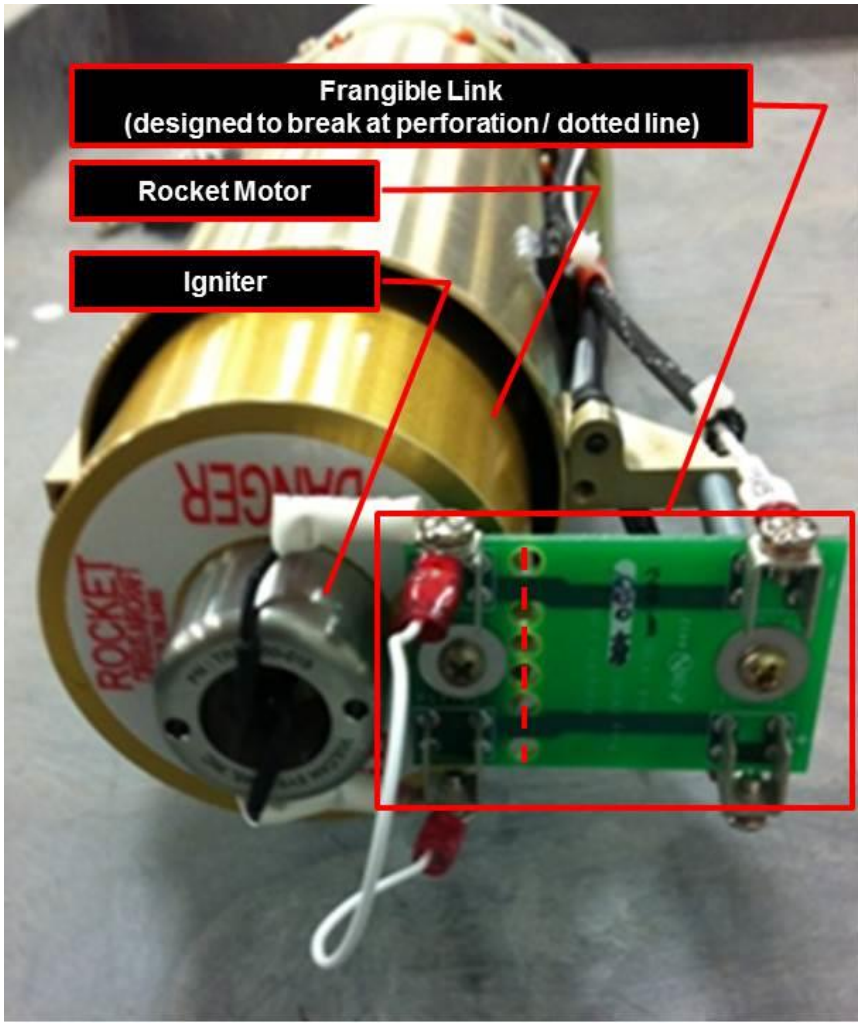
Depending on the situation a wise secondary precaution would be to disconnect both airplane batteries thereby removing electrical power from the rocket's ignition system. See the section on aircraft batteries for their locations.

If a rocket launch were to occur the damage present or objects in the flight path of the rocket could cause the rocket trajectory to be completely unpredictable. The explosive hazards associated with cracked propellant grains also apply. Ensure only essential personnel are present while disabling the system and keep non-essential personnel at a minimum 1,000 foot distance if possible. It is recommended that essential personnel wear full fire-fighter bunker / turnout gear to include a face shield and helmet.

IGNITER & BASE HAZARDS (ELECTRICALLY FIRED)

Rocket Out of Launch Tube

In this system when a rocket motor becomes dislodged from its mounting base and tumbles free of the airplane during an accident it will likely sever the frangible link and become disconnected from the firing circuit.



The best course of action is to locate the rocket, mark its location, and keep everyone away from it until a trained Cirrus technician arrives to render it inert.

IGNITER & BASE HAZARDS (ELECTRICALLY FIRED)

If the situation dictates the rocket motor must be moved then the igniter wires should be “shunted” and care should be taken to keep the rocket igniter wiring away from sources of electricity and the rocket motor away from sources of flames or heat. Remember the rocket is still attached to its source of ignition at this point so think carefully where you put the rocket during transport and storage.

Shunting the wires is simply the process of connecting the two igniter wires together electrically. This can be accomplished in several ways:

1. Strip the ends of the two igniter wires and twist them together with each other.

2. Use a short piece of wire (about 4 inches) to bridge the terminal rings on the frangible link.

3. Use a small nut and bolt to secure the igniter wire terminal rings together.

4. Use an alligator clip to join the two igniter wire terminal rings together.

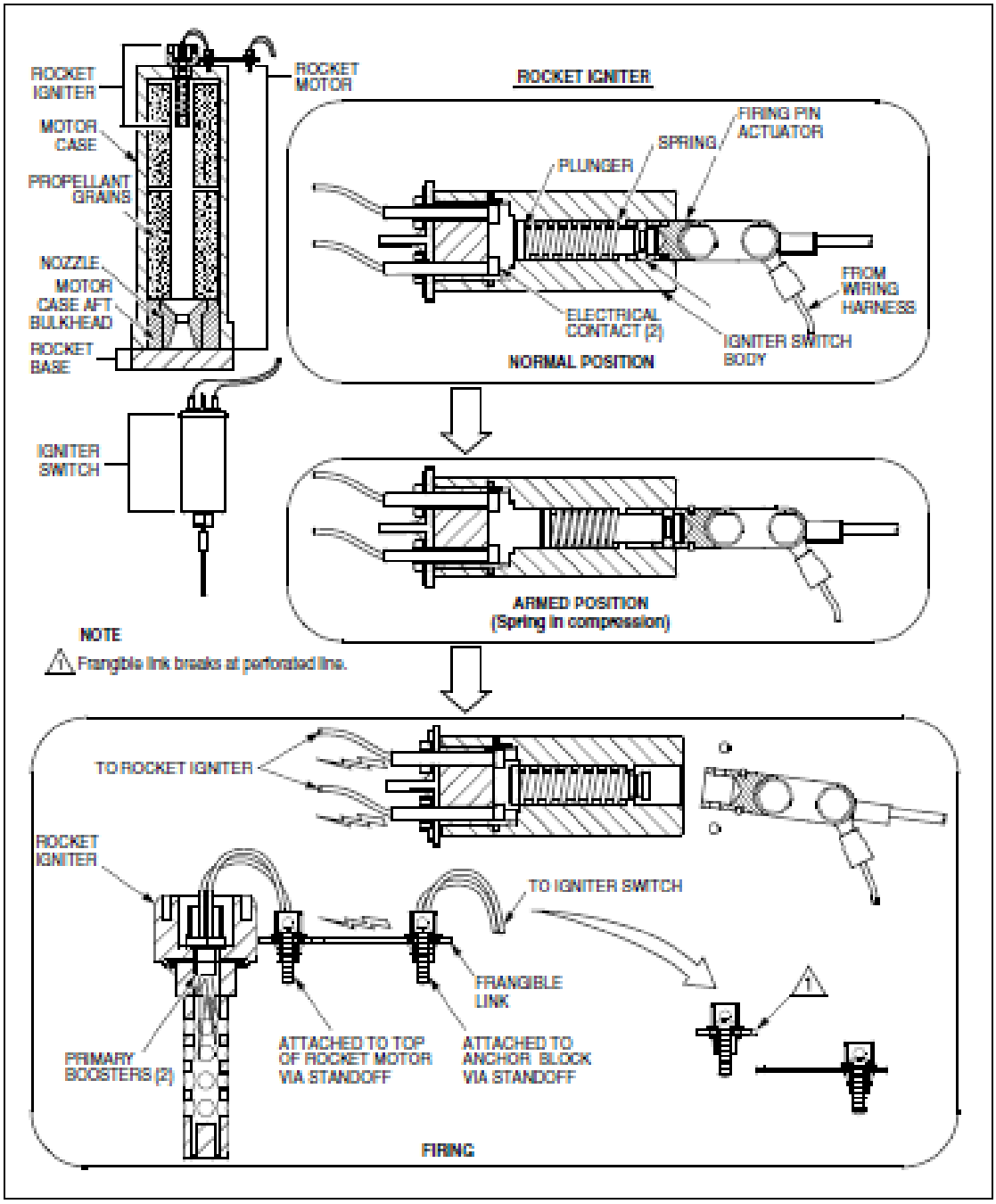
IGNITER & BASE HAZARDS (ELECTRICALLY FIRED)

If activated, a rocket not in its launch tube will have a completely unpredictable trajectory. The explosive hazards associated with cracked propellant grains also apply. Ensure only essential personnel are present while disabling the system and keep non-essential personnel at a minimum 1,000 foot distance if possible. It is recommended that essential personnel wear full fire-fighter bunker / turnout gear to include a face shield and helmet.

Sources of High Powered Radio Transmissions

Do not handle the rocket and igniter in the presence of high powered radio transmissions as there is a possibility that they may set off the igniter under the right conditions. Cell phones and simple hand held radio transceivers are not considered high power. Military communications gear and possibly high powered radio station antennas are the type of thing one should be concerned with. Under normal circumstances the probability of setting off the igniter is remote, but be aware of your surroundings to preclude this possibility.

IGNITER & BASE HAZARDS (ELECTRICALLY FIRED)



REEFING LINE CUTTER HAZARDS

Reefing Line Cutters Hazards

The Reefing Line Cutters consist of two small pyrotechnic devices used to cut a length of nylon cord which holds a 3-ring release mechanism locked in place until the appropriate time in the parachute deployment sequence. Once the ignition loops (pull rings) are pulled free of the reefing line cutter, a fuse burns for approximately 8-10 seconds prior to firing.

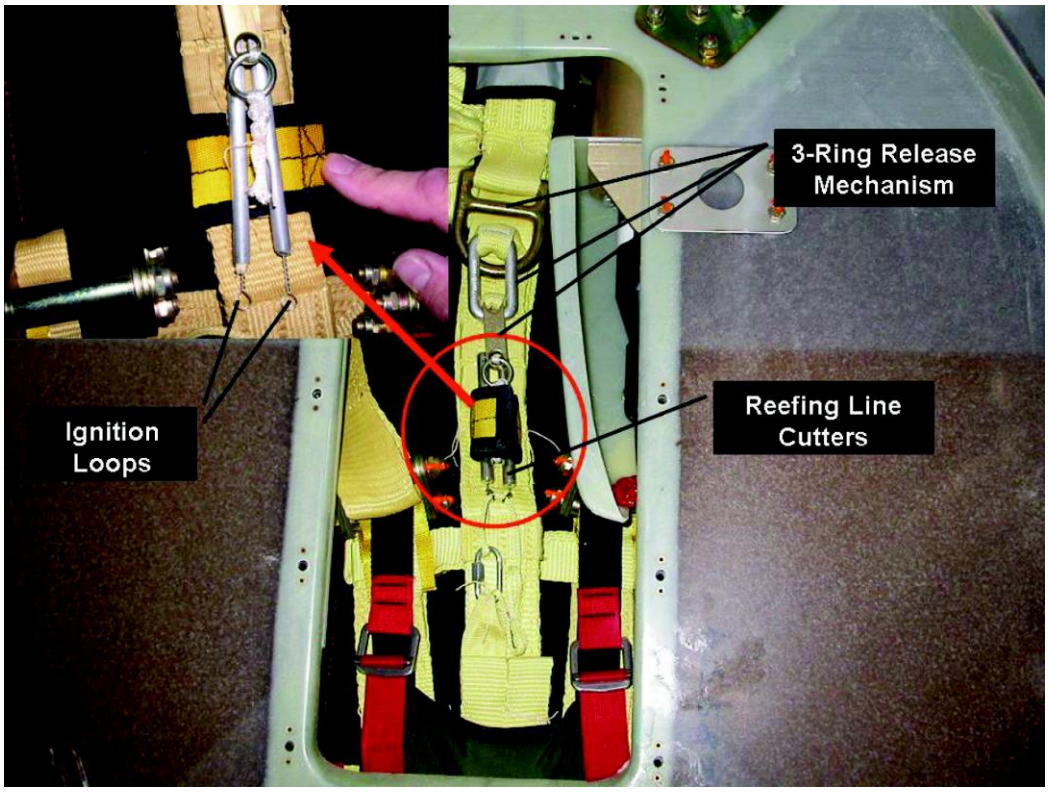
The Reefing Line Cutters are stowed on the front side of the packed parachute assembly. Once the parachute has been deployed they fall free of the airplane.

The fuse can elevate the reefing line cutter housing to temperatures as high as 538 degrees Celsius.

An activated Reefing Line Cutter will cause burns if it comes in contact with skin.

Normal activation after 8-10 seconds results in a small “tick” noise being emitted as the cutter strikes the inside end of the device.

In some instances, after the 8-10 second time delay has elapsed, the reefing line cutters have been known to make a loud bang similar to a firecracker and discharge the cutting blade out the end of the reefing line cutter housing. When this happens **there is potential for serious eye injury to occur.**



PARACHUTE HAZARDS

Parachute Hazards

Rescue personnel are urged not to underestimate the dangers of the parachute.

Parachute inflation can occur in mild wind conditions.

Personnel working on or close to the airplane may be seriously injured or possibly killed if the parachute inflates and begins dragging the airplane.

Personnel working around the parachute's canopy, suspension lines, risers, and harnesses may become entangled and suffer severe injury, possibly death, should the parachute inflate.

As the chute inflates the lines become taut. Anyone trapped between the taut lines and the airplane will be in danger. So will anyone tangled in the lines in general. Roll up the parachute and secure it to prevent inflation.

The parachute canopy, suspension lines, risers and/or and harnesses pose a serious entanglement hazard to divers underwater as well. Appropriate precautions MUST be taken.

While Cirrus Aircraft has not attempted to deflate a parachute, it has been recommended by a parachute manufacturer that a fire hose be used to wet the canopy causing it to deflate. Then use a large vehicle (fire truck) to pin the parachute down PRIOR to detaching the parachute from the airplane.

SECTION 3

CAPS DAMAGE ASSESSMENT

Approaching the Site

Remember to use caution when approaching the accident site. While this document focuses on the CAPS, other airplane hazards still exist. Things like:

- Spilled fuel
- Sources of ignition (electrical sparks)
- Fuel tanks
- Batteries
- Oxygen bottle(s)
- Actuators with stored energy (gas struts)
- Hazardous cargo
- Airbag seatbelts

Approach from the sides and front if the rocket location and status is unknown or upwind if it is (see rocket motor hazards). Utilize your safety training and safety gear.

If the parachute is out of the airplane and in plain sight it is likely that the rocket is expended or separated from its ignition source (percussion ignition) or source of electricity (electric ignition). This **IS NOT GUARANTEED** however. Always remain vigilant; locate the rocket; and treat the rocket as though it is live and ready to fire.

Intact vs. Not Intact

With regards to CAPS, there are two main characterizations of airplanes that have been involved in a mishap – "INTACT" and "NOT INTACT." It is important to be able to distinguish theses two states when assessing the hazards present.

Being that the CAPS is launched utilizing a mechanically activated ignition system it is critical to determine if the activation cable's integrity has been compromised, altered or stretched taut in any manner. Remember: the rocket can launch even when the activation handle safety pin is inserted. The condition of the parachute enclosure and rocket should also be checked (see Activation Cable Hazards).

Airplane Intact

An “INTACT” airplane is one that has been involved in a relatively minor mishap with little or no damage to the fuselage (main body) of the airplane. All doors and windows must be secure and in place with no visible cracks or damage to the fuselage. Doors should open and close without binding.

The photo below is an example of an “INTACT” airplane.

For intact airplanes: “SECURE” the activation handle with the safety pin or a zip tie (see instructions for securing).

After securing the activation handle and cable make sure that rescue or recovery operations do not involve cutting or prying that will endanger the activation cable’s integrity (see Activation Cable Hazards).

Airplane Not Intact

If an airplane is “NOT INTACT” and there are occupants in need of rescue, it is critical to everyone’s safety to “DISABLE” the CAPS.

The only reason to omit disabling the system is imminent danger to the occupants (fire or other) where time is too critical. Understanding and taking this risk will have to be made by the individual at the accident site.

If the accident involves fatalities and there are no occupants in need of rescue or extrication it is common for first responders to cordon off the accident site, contact Cirrus, and await a trained technician’s arrival. This is by far the safest method. The Cirrus technician can fully disarm the system and render all the components inert.

Some of the indicators that the activation cable run may have been altered or compromised are:

- Damage to fuselage (main body)
  - Cracks
  - Tears
  - Deformation
- Doors do not open or close freely, binding is present
- Windows or window frames are cracked or fractured

If any questions or doubts persist about the safety of the CAPS call the Cirrus Aircraft Air Safety Department and speak with a trained technician. If possible, it is greatly helpful if someone on site can email photos taken with a smart phone to the Air Safety technician to aid in determining the condition of the CAPS.

The photo below is a good example of an airplane that should not be disturbed or moved until the CAPS has been disabled.

The photo below is a good example of an airplane that is NOT INTACT. Note that the ceiling/roof of the airplane has been crushed in affecting the CAPS activation cable routing. Also note, that the parachute enclosure cover has started to come off also indicative of unknown damage to the inside of the airplane.

Quick Reference Guide

The following condenses the contents of this manual into a quick reference guide. It lacks critical details, but should make a useful aid in assessing CAPS hazards and formulating a course of action.

Airplane Intact

- Activation cable is intact – "SECURE" the cable by putting in safety pin
- Ensure further rescue & recovery efforts don't endanger CAPS activation cable integrity
- Rocket can still be set off by fire / heat

Airplane Not Intact

- **Parachute out on ground**
  - **CONTAIN THE PARACHUTE** – prevent it from inflating
  - Rocket is likely to be expended or separated from its igniter or source of electricity
    - **REMAIN VIGILANT**
    - Locate the rocket
    - Treat it as though it is still live and ready to fire
- **Location of rocket**
  - Rocket in launch tube
    - Percussion & Electric Ignition Systems
      - Rocket is still connected to igniter
      - Activation cable can fire rocket
      - Movement or disturbing wreckage can fire rocket if activation cable altered or stretched
      - Rocket can still be set off by fire / heat
  - Rocket out of launch tube
    - Percussion Ignition System
      - Rocket not connected to igniter -- activation cable cannot fire rocket motor
      - Rocket can still be set off by fire/heat
    - Electric Ignition System
      - Rocket still connected to igniter, but no electricity present to fire igniter
      - Shunt wires
      - Beware of high powered radio transmission
      - Rocket can still be set off by fire/heat

- **Condition of activation cable (rocket in launch tube)**
    - No damage to airplane along cable routing – risk of hair trigger low – “DISABLE” as a precaution
        - 1,000’+ safety zone for non-essential personnel
        - “DISABLE” system based on occupant scenarios below
        - Full bunker / turnout gear recommended
    - Activation cable routing altered or cable stretched
        - 1,000’+ safety zone for non-essential personnel
        - “DISABLE” system based on occupant scenarios below
        - Full bunker / turnout gear recommended

- **Occupant rescue with imminent danger (fire / other)**
    - Individual decision
        - Hazard risks are high
        - Injury/death to first responder possible
    - Rescue occupant with hazards present or “DISABLE” CAPS concurrently while rescuing occupants

- **Occupant extrication without imminent danger (fire/other)**
    - “DISABLE” CAPS
    - Secure other hazards present (list not all inclusive)
        - Airbags
        - Electrical System
        - Fuel System

- **Occupants deceased CAPS cable altered or stretched taut**
    - Safest course of action
        - Secure accident site
        - Contact Cirrus Air Safety
        - Wait for trained technician to render CAPS inert for you

SECTION 4

SECURING & DISABLING CAPS

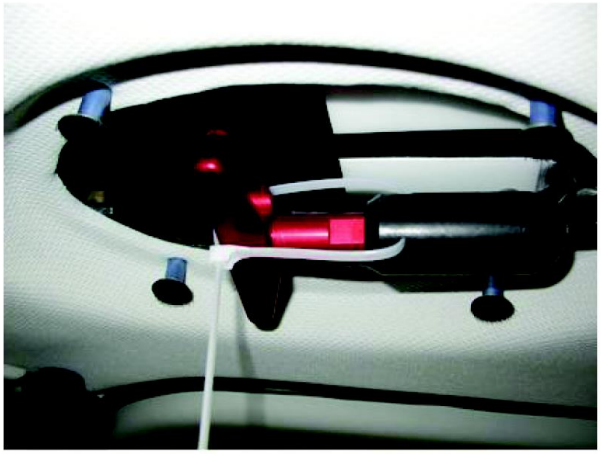
SECURING

Definition:

“Securing the CAPS” is the process of inserting the CAPS activation safety pin into the activation handle and handle holder. This process is used ONLY when there is little or no damage to the fuselage (main body) of the airplane and further damage by rescue efforts is NOT expected. In this case the airplane is characterized as “INTACT.”

Instructions:

The pilot normally will remove the CAPS safety pin from the actuation handle prior to flight and replace it after flight. With this in mind the safety pin can usually be located somewhere in the forward section of the cockpit and inserted into the activation handle holder located in the ceiling between the front two crew seats. If the safety pin cannot be located the use of zip ties is recommended as a temporary substitute.



DISABLING

Definition

"Disabling" is the process of cutting the activation cable as close to the igniter assembly as practical. This process leaves the ignition source connected to the rocket motor, but removes the majority of the activation cable so that it does not inadvertently activate the igniter assembly. Removing this potential hazard decreases the risk of inadvertent ignition substantially enough to proceed with rescue efforts.

This is a temporary measure intended to allow rescue of occupants and if necessary movement of the airplane for a short distance, i.e. off an active runway at an airport or removal of the airplane from a road or highway.

It is NOT intended as the final disposition for the system. The system requires a trained technician to disassemble the components and render them inert prior to further transport or storage.

Disabling is performed any time the airplane is characterized as "NOT INTACT."

Instructions

All non-essential personnel should stay well clear of the area. A 1,000 foot or greater safety zone is recommended. It is also recommended that personnel performing the disabling should be wearing complete fire fighter bunker / turnout gear to include helmet and face shield.

If the airplane is considered "NOT INTACT" the damage and position of the airplane's fuselage needs to be assessed. **Do NOT move the wreckage!** Approach from the front or sides until the rocket location and status is determined. The best course of action needs to be determined for accessing the CAPS activation cable as close as possible to the igniter assembly.

The course of action determined must avoid further disturbance of the wreckage which might cause the activation cable to fire the rocket.

WARNING:

ONLY USE A TOOL SPECIFICALLY DESIGNED FOR CABLE CUTTING. DO NOT USE BOLT CUTTERS, DIAGONAL CUTTERS, LINEMAN'S PLIERS OR OTHER SUBSTITUTES.

TOOLS OTHER THAN A CABLE CUTTER MAY TWIST AN ALREADY TAUT ACTIVATION CABLE CAUSING THE ROCKET TO FIRE.

Once access is gained to the activation cable near the igniter assembly, a cable cutter must be utilized to cut the cable. Any added twisting to the cable may fire the rocket if the cable is altered or pulled on.

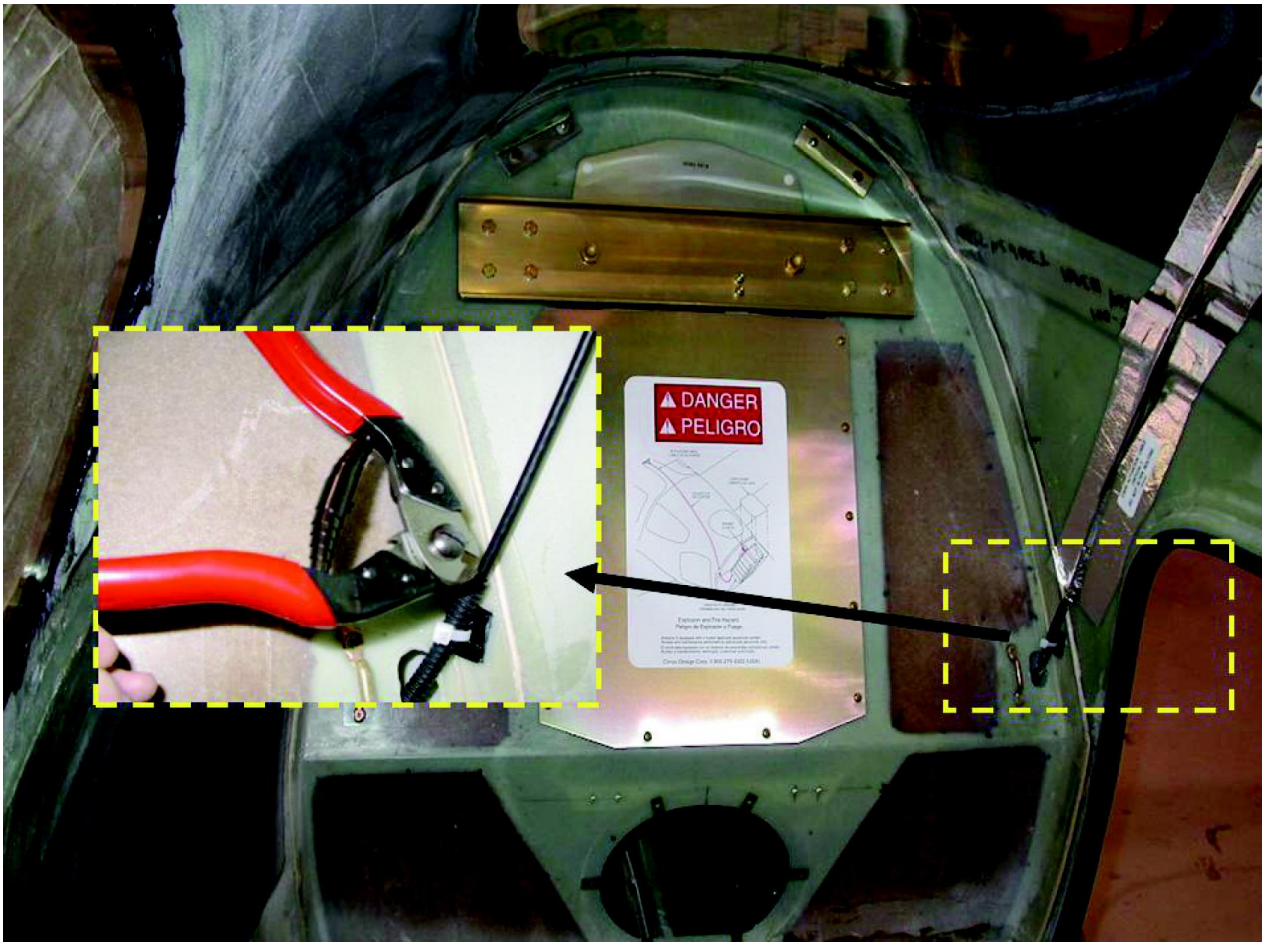
There is always the risk that the activation cable may be taut enough that it could fire the system even when using the proper cable cutter. Cirrus technicians have performed this procedure since 1999 on many accident sites and this has never happened to date.

Disabling the system is performed the same for both the percussion and electrically fired ignition systems.

Additional precautions may be taken in the electrically fired system. Both aircraft batteries can be disconnected and the igniter wires shunted.

Oftentimes the activation cable is accessed through the baggage compartment door. The carpeting on the aft side of the door frame can be pulled back and the cable can be cut where it passes through the back wall of the baggage area.

The photo below is of an interior without carpeting and interior panels for better clarity.


DANGER
PELIGRO

Cable Cutters

Below are examples of proper cable cutters that will cut without twisting motion to the cable thereby preventing unwanted additional stretching and/or pulling on the activation cable.

C-7F Felco cable cutter

S & F #316 cable cutter

Shimano cable cutter

Knipex cable cutter

Cable Cutters

The following table is provided to aid in the purchase of a proper set of cable cutters.

Felco-C7F	**Knipex**	**Shimano**	**S & F # 316**
Aircraft Spruce and Specialty www.aircraftSpruce.com 1.877.4-Spruce 951.372.9555 P/N 12-01135 List Price: $48.75	95-61-150 Bowden Cable Cutter (Similar to C7F) KC Tool Co 19936 W 162rd Street Olathe, KS 66062 913.440.9766 List Price: $37.28	BicycleBuys.com TL-CT11 P/N CT-11 Sku# 1736330 List Price: $49.99	Aircraft Spruce and Specialty www.aircraftSpruce.com 1.877.4-Spruce 951.372.9555 P/N 12-18600 List Price: $17.95 - 18.50

DISARMING

Definition:

Disarming is the process whereby the rocket motor is physically separated from the ignition source, disassembled and rendered inert. The igniter, base, and reefing line cutters are also rendered inert.

Instructions:

Coordination should be made with Cirrus Air Safety to have a trained and authorized technician dismantle and render the CAPS components inert (see contact info in Preface). Occasionally local bomb squads choose to dispose of the components through use of explosives. While Cirrus does not have the authority to prohibit such actions we recommend against it due to the unnecessary level of risk this process introduces.

SECTION 5

OTHER SYSTEMS & HAZARDS

Engine Shut Down

Engine shut down can be accomplished by one or more of the following of the following:

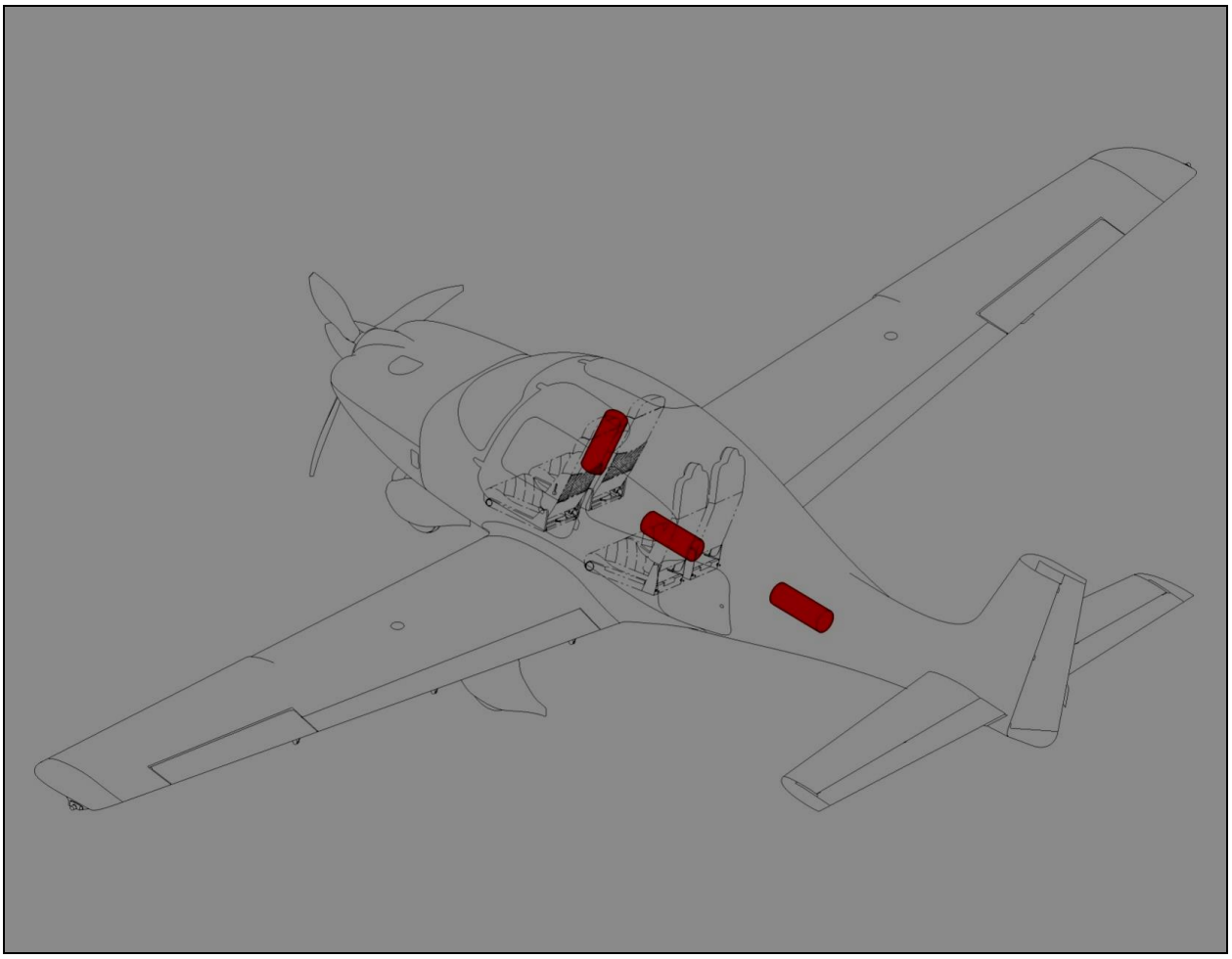
1. Turn ignition key to OFF
2. Pull Mixture Lever to Idle Cut-off position (pull towards back of airplane)

Fuel System

The fuel system can be secured by locating the fuel selector switch located on the center console and turning it to the OFF position. To select OFF, first raise the fuel selector knob release and then rotate the knob to OFF (left or right).

Oxygen Systems

Cirrus airplanes can be outfitted with portable and supplemental oxygen systems. First responders are cautioned to assume an oxygen bottle is installed on every airplane and take the appropriate precautions.



Likely locations of oxygen bottles in Cirrus airplanes.

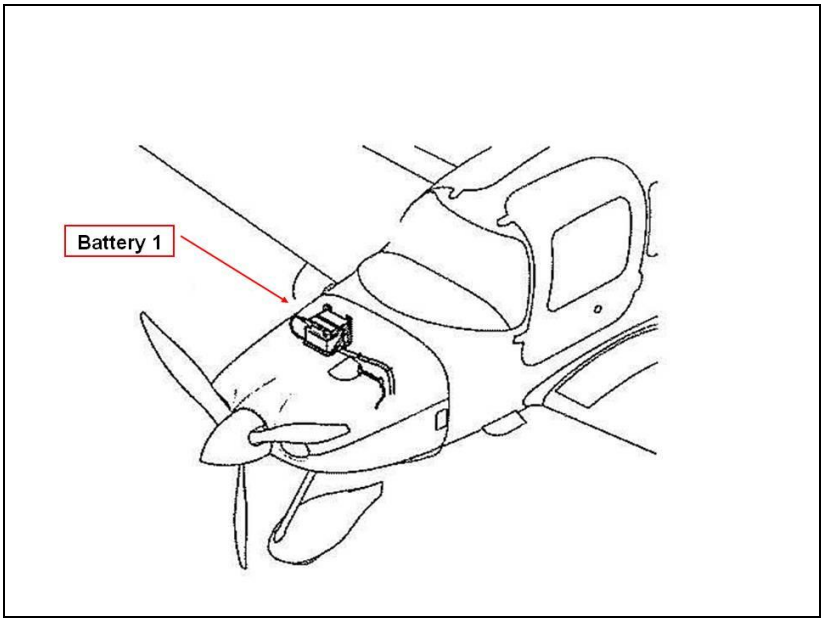
Electrical System

The electrical system can be shut off utilizing the bolster switches on the left bolster panel directly forward of the left front crew seat. Pushing down on the aft side (nearest to you as sitting in seat) of the rocker switch will move them to off. Shut off all switches.

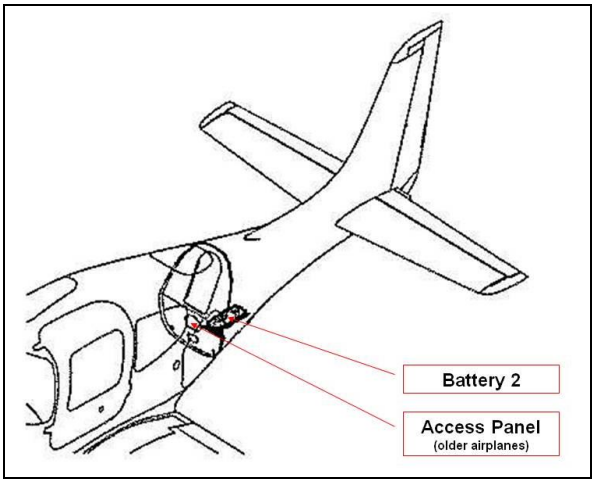
Aircraft Batteries

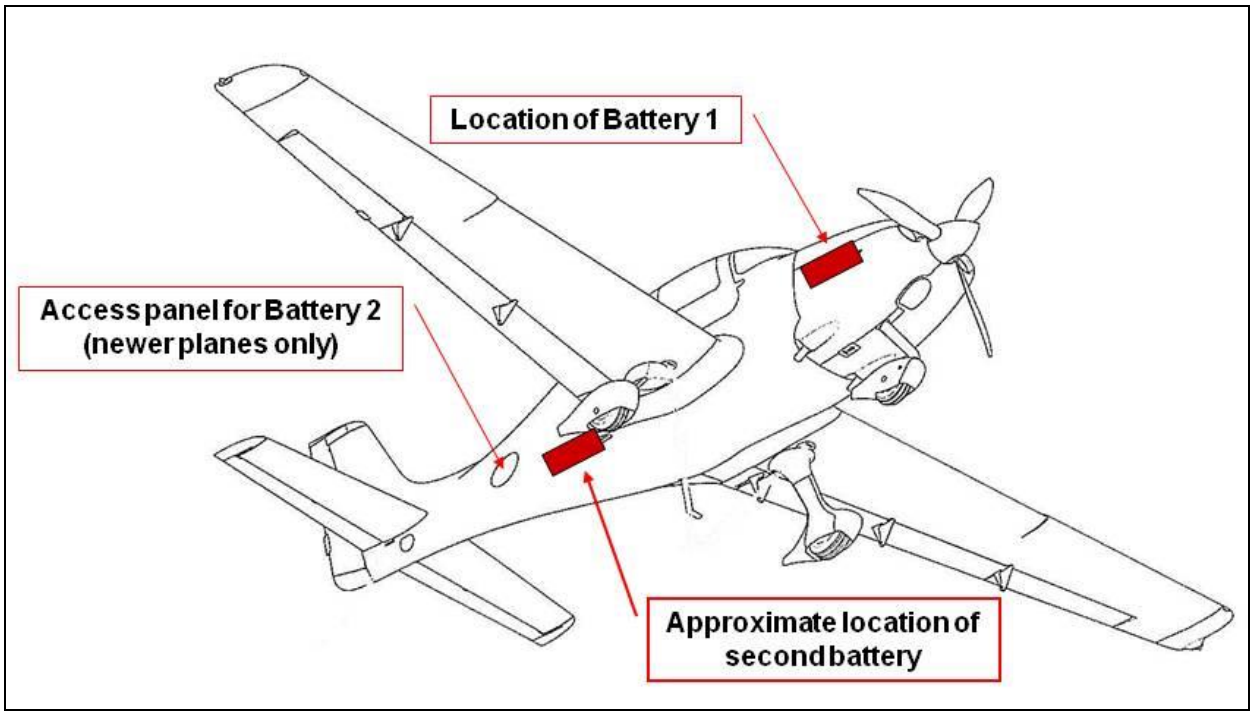
Most Cirrus airplanes are “all electric” and carry TWO main batteries. Once the airplane has been secured by fire fighting personnel it is common to disconnect the batteries to assure the electrical system will not become an ignition source for fire. This is doubly important on airplanes with an electrically fired CAPS. Disconnecting both batteries will remove the rocket igniter’s normal source of electricity.

Battery 1 is located on the right front side of the firewall aft of the engine as viewed by the pilot sitting in the airplane.



Battery 2 is located in the empennage just aft of the baggage compartment wall. On older airplanes the baggage compartment carpeting must be pulled free of the Velcro securing it to the wall. Then remove the access panel near the floor to reach the battery. On newer model airplanes the avionics bay access panel is located on the exterior of the airplane on the right side of the tail (empennage).





Airbag Seatbelts

Most Cirrus airplanes are equipped with airbag seatbelts. Airplanes equipped with airbag seatbelts have an inflatable shoulder harness integral to each crew seat harness. The electronic module assembly, mounted below the cabin floor, contains a crash sensor, battery, and related circuitry to monitor the deceleration rate of the airplane. In the event of a crash, the sensor evaluates the crash pulse and sends a signal to an inflator assembly mounted to the aft seat frame. This signal releases the gas in the inflator and rapidly inflates the airbag within the shoulder harness cover. After airbag deployment, the airbag deflates to enable the pilot/co-pilot to egress the aircraft without obstruction.

Identification

Airbag seatbelts can be identified by their appearance and with the aid of placards. Seatbelts without airbags consist of just the nylon webbing. Seatbelts with airbags have a thickened section that appears padded. The outboard shoulder harness (one closest to the door) contains the actual airbag. The inboard shoulder harness is padded for appearance and comfort. See photos below.

No Airbag

Airbag

Placards

The padded portion of the seatbelt harness is marked and there are tags with placarded warnings on the lower lap belt as well.

Disarming

The AmSafe seatbelt airbag can be disarmed by either cutting the wires or disconnecting the yellow connector plug between the Electronics Module Assembly (EMA) located under the floor and the inflator assembly located in the seat back. Seatbelt airbags have their own power source.

Disconnecting the airplane's batteries DOES NOT disable the seatbelt airbags.

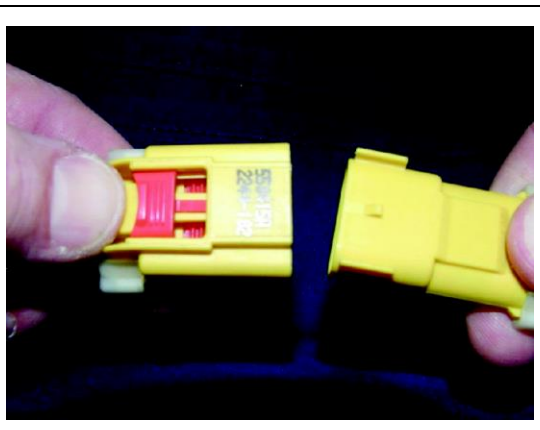
This must be done for EACH SEAT.

Disconnecting one seatbelt airbag DOES NOT disable the other seatbelt airbag.

The connector and wiring are located beneath the seat on the forward side.

To disconnect the yellow plug: slide the red locking tab to the side and pull the two connector halves apart.

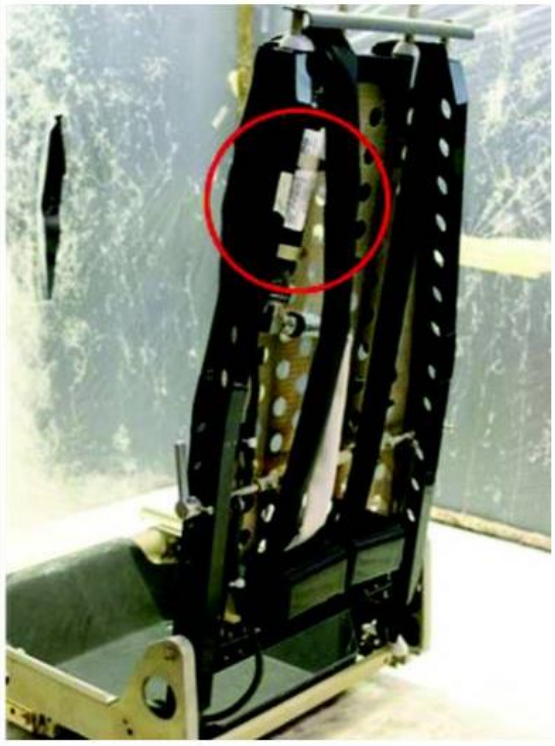
If you are unable to disconnect the yellow connector plug, cut the wires on either side of the yellow plug.



High Pressure Inflator

The inflator assembly consists of a small gas cylinder mounted in the seat back of the seat it inflates. First responder personnel should take caution when working around the inflator assembly with cutting or puncturing type tools. The system uses Helium which is inert, but is stored at very high pressures (6250 psi). Severing the gas cylinder could pose a projectile or fragmentation hazard to nearby personnel.

The inflator assembly has membrane that is designed to melt at approximately 190-230 degrees Celsius and will release the stored gas prior to the pressure vessel being compromised. One should exercise caution and wear full protective gear while engaged in fire fighting and occupant extraction.



Composites, Dust, Fibers, Fumes

Fire fighting personnel must wear full breathing gear when fighting aircraft fires. Caution must be exercised after a fire is put out and recovery efforts begin. Burning composite materials produce toxic gases. Following the suppression of fires personnel on an accident site must remain vigilant at all times.

Personnel without full breathing equipment are recommended to avoid being near any smoking wreckage. Wait until all fire, heat, and fumes have exhausted themselves completely before entering the accident site. After this time has elapsed it is recommended that personnel wear a respirator with an organic vapor filter as a precaution. Additionally the respirator should be fitted with a dust filter as well.

Cirrus airplanes are comprised mainly of fiberglass cloth, carbon fiber, foam core materials and resins (glue / plastic like substances). If firefighting efforts have taken place accident sites contain large quantities of dust and fibers. The dust and fibers are a skin irritant and a breathing hazard. Use of a respirator is recommended. The dust, fibers, and debris are also a common source of eye injury. Wear eye protection at all times. Wear long pants and sleeves to protect exposed skin as much as possible. Be cognizant of others around you as your actions may blow or throw dust or debris in their direction when they are not prepared for it.

Composite and metal airplane structure can have extremely sharp edges and sharp protrusions. When moving around the accident site use caution where you walk, bend over, or move in general. Wear heavy leather work gloves and work boots while working on site to avoid injury.

Carbon fiber splinters are not rejected by the human body the same as a common wood splinter and require medical attention to have removed.

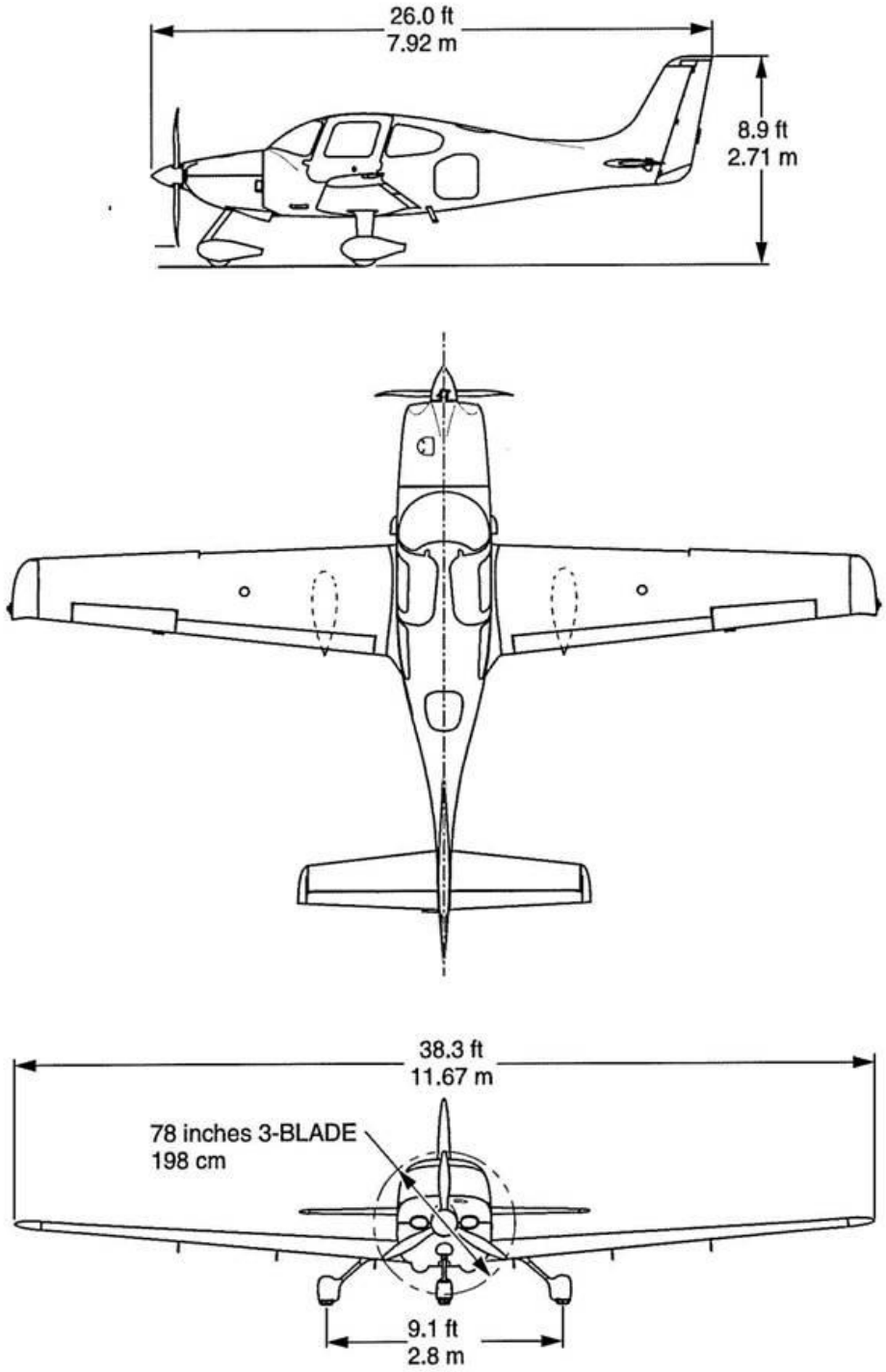
Use of cutting tools to gain access is recommended instead of incurring injury by attempting to bend or break composite structure by hand.

Burnt composite structures may look intact but if damaged by heat or fire may not support weight. Treat all composite structures that have either been on fire or exposed to extreme heat as though they are NOT structurally sound.

3M 2097/07184*
Particulate Filter P100
Filtre P100 contre les particules
Filtro contra partículas P100
Filtro contra partículas P100 [P3]
2097
NIOSH
P100
3M 6300/07026
Half Facepiece, Large
3M 6003/07047
Cartuchos contra Vapores Orgánicos / Gases

Dimensions, Weights, & Fluids

Dimensions



Weights

	SR20	SR22	SR22T
Max Gross Weight	2900 – 3100 lb	3400 lb	3400 lb
Standard Empty Weight	Approx. 2150 lb	Approx. 2400 lb	Approx. 2400 lb
Engine (basic weight w/o accessories, prop, etc.)	380 lb	456 lb	456 lb

Flammable Fluids

	SR20	SR22	SR22T
Aviation Gasoline	61 gallons	84 gallons	94.5
Oil	8 quarts	8 quarts	8 quarts
TKS (anti-ice fluid)	n/a	2.96-3.5 gallons	8.5 gallons
Mil-H-5606 Hydraulic Fluid	0.25 quarts	0.25 quarts	0.25 quarts