OPERATION

The BRS-6 product you have purchased is a rocket-deployed emergency parachute system for use on experimental , LSA and ultra-light aircraft. It is designed to recover the aircraft in life-threatening emergency situations, lowering the aircraft with occupants, to the ground with a survivable rate of descent. Your BRS-6 system is activated by pulling on a T-shaped handle that must be mounted within easy reach of the pilot and/or passengers.

This section is a general guideline for the **operation** of all BRS systems installed on experimental aircraft. **It is absolutely mandatory that you read this section in its entirety before operating an aircraft with a BRS-6 Emergency Parachute System. In addition, it is also advised that you read the remainder of this manual.**

BRS™-6 SYSTEM OPERATIONAL LIMITS

Detailed parameters can be found at the end of this manual, and CAD drawings with overall dimensions are available form BRS.

NORMAL PROCEDURES

Installation of a BRS system does not change the normal procedures necessary for safe operation of your aircraft. The following preflight procedures should be added to the normal aircraft preflight and all items should receive as much attention as any other part of your aircraft before flight:

BRS Pre-Flight Checklist

- ✓ **Remove any and all protective covers from the BRS unit**
  i.e. plastic or other wrapping that may protect the unit from moisture between flights.
- ✓ **Check service dates on data label for expiration**
- ✓ **Check security of airframe connections**
  Inspect Nylon Cable Ties for UV damage. (Cable ties must be replaced every 6 months.)
- ✓ **Check integrity of airframe bridles**
  Both at terminals (look for deformed thimbles on steel bridles) and along its length. Look for torn plastic coating (stainless steel) or fraying (Kevlar®) that may reveal wear.
- ✓ **Check routing of airframe bridle**
  Though your installation should have assured no interference, check *again* to be sure the bridle is *still* well secured so as not to interfere with:
  a) the firing of the rocket or the extraction of the parachute,
  b) the propeller, or
  c) any control linkages.
- ✓ **Check parachute container and rocket mounts for:**
  a) security that it will not move in-flight,
  b) that the rocket is *still* aimed in the correct direction, and
  c) that the container is still positioned as originally desired.
- ✓ **Check all bolts and nuts (3 threads showing, min.)**
- ✓ **Check activating handle for:**
  a) removal of Safety Pin and Flag,
  b) kinks or other damage to the activating housing, and
  c) security of the housing (not dangling or stretched, plus *still* fastened along its route).
- ✓ **Check stainless steel link security**
- ✓ **Check sealed cap security (on canister and VLS only)**
- ✓ **Check exterior cap security (on canister only)**
- ✓ **Check Velro flap security (on softpack only)**
- ✓ **Check egress cover security (if installed)**
- ✓ **Passenger briefing**
- ✓ **Review emergency procedures described below**

NOTE: The above preflight checklist is meant to be used *in addition to* your regular aircraft preflight checklist. It *is not* intended to be a substitute for any other preflight checklists. Another copy is included at the end of this Handbook that can be removed and used separately.

EMERGENCY PROCEDURES

This section identifies the situations for which the system should be activated, outlines the proper activation procedures, describes the deployment environment, and describes the post-touchdown activities.

1. Deployment Scenarios

The following scenarios describe situations in which activation of the BRS system may be the only means to save the airplane occupants from serious injury or fatality. These scenarios do not represent all possible situations nor do they represent situations in which activation of the BRS system is the only option.

⚠ WARNING

The BRS system is intended to be used only in an extreme emergency in which recovery of the occupants of the airplane using other EMERGENCY PROCEDURES is not possible. If the airplane is controllable and structurally capable of flying to a safe landing site, the BRS system SHOULD NOT BE ACTIVATED. If the airplane is uncontrollable and/or a forced landing on extreme inhospitable terrain cannot be avoided, the BRS system SHOULD BE ACTIVATED.

⚠ CAUTION

The extreme emergency in which the BRS system must be activated requires that it be activated in a timely manner. Do not wait until the airplane has exceeded the airspeed and load factor operating envelope, is at an altitude which does not allow the parachute to fully deploy prior to ground impact, or is in an extreme attitude.

BRS systems are not intended to be a substitute for good pilot judgment, skills and training, proper preflight planning, proper aircraft maintenance and preflight inspections, and safe aircraft operations.

Mid-air collision - A mid-air collision will completely disable most aircraft. Most mid-air collisions occur at relatively low altitudes or in the landing traffic pattern. If a mid-air collision occurs, the pilot must immediately determine if the airplane is controllable and structurally capable of flying to a landing site. If not, the pilot should activate the BRS system immediately.

Structural failure - A structural failure can result from many conditions: encountering a severe gust at speeds above the aircraft's structural cruising speed, exceeding design load factor at speeds above the aircraft's maneuvering speed, wake turbulence or a degrading and/or defective aircraft structure. If a structural failure occurs, the pilot must determine if the airplane is

controllable and structurally capable of flying to a landing site. If it is not, the pilot should activate the BRS system immediately.

Loss of control - Loss of control could result from a control system failure, wake turbulence, severe airframe icing or pilot disorientation. If control can be recovered before the aircraft is in danger of ground impact, the pilot should do so and not deploy the BRS. If the airplane cannot be controlled, the pilot should activate the BRS system immediately.

Stall/Spin on approach - The stall tightening to a spin due to pilot distraction on landing approach is a dilemma long faced by aviation. With its low altitude recovery capability, the BRS unit could save some occurrences from becoming fatalities. The BRS unit is not guaranteed to fully decelerate an aircraft from extremely low altitudes, but a spin below 500 feet is a grave problem, and the BRS unit may offer your only alternative.

Engine-out over hostile terrain - An engine-out emergency should not be a reason to deploy the BRS unless the terrain below will not accommodate a safe landing. If the surface is extremely rough, a safe landing may be impossible. At night or in ground fog conditions, visibility may not permit a safe landing approach. If a safe landing is not possible, the pilot should activate the BRS.

Pilot incapacitation - Passengers must be briefed on the BRS location and operation prior to take-off. If the pilot is incapacitated and cannot fly the airplane to a safe landing and the passenger does not have the training or skills to fly the airplane to a safe landing, the passenger should activate the BRS.

Some situations provide scenarios where BRS system deployment is not desirable. These have a central theme: if the aircraft can still be controlled, continue flying the airplane to a safe landing.

Out of fuel, with landing areas within reach - If a landing area is available and the aircraft is controllable, the airplane should be flown to a normal landing.

Lost, with fuel remaining - Getting lost, or being uncertain of control of flight, may seem a life-threatening situation. If sufficient fuel remains and if the airplane is controllable, the airplane should be flown to a safe landing.

IMPORTANT NOTE: The above review is *not* intended to be a complete listing. Flight is sometimes described as long periods of complete boredom punctuated by brief periods of total fear. While a humorous oversimplification, it is a meaningful statement in that flight can suddenly present a hazard that demands fast, correct action. While this asks a lot of ordinary humans, it does not mean you should always resort to your “ace in the hole…” your BRS.

2. Proper Activation Procedures

As with any aircraft emergency situation, it is essential to practice simulated activation procedures, so that a sequence of pilot actions comes naturally. During an extreme emergency, the pilot's senses and faculties will be highly stressed.

⚠ CAUTION

It is not reasonable to think that you will act calmly and logically, if you do not practice a sequence ahead of time. You should also assure the activating handle is usable during a stressful condition, which demands thoughtful handle placement.

Before flight, be sure to remove the safety pin (the flag is intended to help you remember this). Procedures in the following operational checklist assume that this has been done and are immediate action items, which should be committed to memory:

- ✓ **KILL THE ENGINE (engine "kill" switch or pull mixture)**
- ✓ **PULL THE ACTIVATING HANDLE… hard continuously!**
- ✓ **SECURE RESTRAINT SYSTEM**
- ✓ **ASSUME EMERGENCY LANDING POSITION**

The following amplified procedures elaborate upon this operational checklist. These procedures include information not readily adaptable to a checklist format, and material to which the pilot could not be expected to refer to in an emergency.

KILL THE ENGINE

It is very important to stop the engine before firing the BRS. While on some aircraft (tractor-mounted engines for example), engine shut-down is not mandatory, it is a valuable practice. On pusher-engine aircraft, shutting the engine down (or at least moving the throttle to idle thrust) may make the difference between a successful deployment and a failed one. In either case, a distressed aircraft will be safer to its occupants if the engine is not still running.

⚠ DANGER

POWER TO THE ENGINE MUST BE SHUT OFF BEFORE DEPLOYING A BRS PARACHUTE. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH. As stated earlier, the Kevlar® that BRS uses for harnesses and bridles is very resilient to cutting, yet could still be severed if the engine is not shut off and the propeller is still turning! If a bridle or harness does survive contact with a moving propeller, it may nonetheless be drawn into the prop's hub, possibly causing a malfunction or at least an improper descent attitude.

PULL THE ACTIVATING HANDLE

Grasp the entire handle in your hand and pull vigorously from the handle holder. Do not use only a couple fingers. The handle has been designed to be gripped with a gloved hand. Although only a small movement is needed to cock and detonate, you should pull a longer length to be sure you've pulled enough. ***You cannot pull the handle too far***. *If* the activating handle housing is well secured along its length, the complete pull

(*both above actions)* may be as little as 3 inches. However, it is best if you plan to pull it at least six inches.
The first movement of the handle "arms" the system. The BRS unit *is not* an explosive waiting to go off. It must first be armed—or "cocked"— to put the system in readiness for detonation. Though you should feel no difference in handle pressures, the second action created by a generous pull of the handle is to release the hammer which will cause the rocket motor to ignite.

⚠WARNING

If the activating handle housing is very loose, making the required pull longer, it is possible during a high-stress situation to not be able to pull the handle far enough to detonate the rocket. This may also be due to cockpit confinement whether by design or damage to the cockpit area. The only possible prevention of such a dilemma is to properly secure the activating handle housing along its chosen route.

⚠CAUTION

While the handle has also been designed not to snag on clothing on entry/exit or during aircraft control movements, it is the responsibility of the pilot to be careful of movements around the handle after first assuring a good location for the handle mount.

3. Post-Activation Environment

Parachute Inflation Location

The parachute will always inflate in the same place, and it's very logical when you think about it. The parachute *always* inflates "downwind" of the aircraft.

Many pilots have thought that firing the BRS rocket upwards would be optimal. As the aircraft will eventually be underneath the canopy, this misconception is quite understandable. However, the final relationship of canopy over aircraft does not have much to do with the best direction to launch the rocket.

The inflation location being in the aircraft's airflow explains why BRS recommends firing somewhat rearward, slightly to the side (to miss tail surfaces), and downward. Some aircraft simply cannot use this method, resulting in top-mounted installations.

Aircraft attitude after deployment

Once the action described above occurs, the aircraft will be in a different aerodynamic environment than during normal flight. As the rocket launches, the sleeve (or bag) enclosed parachute, suspension lines, and riser are extracted and the entire assembly moves rearward (due to relative wind influences).

The first pull is called "snatch force." This is the action that occurs when the extracted parachute and all suspension lines and risers have reached the fullest extent of their length. Snatch force is a function of the inertia of moving components (rocket, parachutes, lines, riser, bridles). When they reach this point, the aircraft with all its prior momentum will pull against these components of the BRS unit. Snatch force is significantly less than opening shock and can rarely be felt by the pilot/passengers.

As the air fills the canopy, the forward motion of aircraft will be slowed, rather quickly. When this happens the nose will be raised, also rather sharply, just as if you

had pulled the joystick back forcefully. The second force, called “opening shock,” occurs when the canopy fills (after the slider disreefs). This action will occur very briefly after any snatch force is felt (approximately one half to one second, depending on parachute design). The force of opening shock is significantly greater than snatch force. For most persons, this will be the main force felt. Opening shock can generate loads of 3-7 Gs.

As the parachute opens, the aircraft will feel as though the “brakes” are being applied sharply, and may be accompanied by a very noticeable pitch up attitude. Actually, the aircraft will be slowed in its forward motion, and the parachute—providing this deceleration—will actually move forward relative to its opening location. The new relationship of canopy to aircraft is now in its descent mode (that is, canopy “above” aircraft). Descent of both aircraft and parachute will be approximately 20-25 feet per second (which translates to about 14-17 miles per hour).

Following the rapid slowing of the aircraft, an oscillation will follow. This is a period when the aircraft swings in a pendulum manner until it stabilizes directly below the canopy. While this pendulum effect is dampened quickly by the aircraft structure, periods of instability may re-occur due to varying atmospheric conditions on descent.

⚠ WARNING

If the aircraft speed was high at deployment, this de-stabilization can continue longer. If the altitude at deployment was low (a relative factor; “low” may be 100 or 500 feet), the oscillations may not cease before the aircraft reaches the ground. *If the latter is true, the aircraft may strike the ground in an unusual attitude, which could result in injury or death to occupants.(see “Touchdown Point,”below).*

Some control of the aircraft may still be present, but don’t count on any at all to direct you to a chosen landing area. You may be able to direct the aircraft another way—assuming control surfaces are intact and receiving enough airflow—but you will not be able to move any direction except with the wind. If you are flying a tractor-engine design, and your engine is still running, testing has shown it possible to tow the parachute somewhat, but you should still shut down before impact. Only use the towing capability in a life-threatening situation, and then shut down again! Towing does increase the rate of descent.

4. Touchdown Environment

Touchdown point

Unlike sport parachuting, where an experienced skydiver can expect to land extremely close to a predetermined landing spot, an aircraft under its BRS canopy has very little directional control.

As you will probably have very little chance to choose when to deploy your BRS, the combination of an unplanned deployment and lack of directional control will take you “wherever the wind blows you.”

Though in some cases, the aircraft may be able to exert some control over heading, you cannot assume this opportunity. Therefore, you must expect the worst.

Touchdown Speed

As stated above, vertical velocity could be as high as 20 miles per hour (and perhaps higher depending on ground elevation). This speed may not sound fast, but think of striking a fixed object while running at 20 miles an hour. You would surely sustain an injury.

SECURE RESTRAINT SYSTEM

Many aircraft—from ultralights to older general aviation planes—have only a lap seat belt. While this suffices in some situations, it may well not be satisfactory in the case of, for example, a structural failure or midair collision. A more secure restraint system is necessary if any type of radical flight activity (unusual attitude) results which could cause a pilot (or passengers) to be thrown around violently. Four or five point seatbelt systems, provide a high level of security. Properly installed, they should keep pilots and passengers with their aircraft, held firmly in their seat. Whatever restraint system you might have, now is the time to tighten it down.

BRS recommends that all aircraft have, at least, a lap belt with shoulder harness for each occupant.

ASSUME EMERGENCY LANDING POSITION

It is wise to plan a posture that will protect you (and any passengers) the most in the case of a rough terrain touchdown. A recommended emergency landing body position (shown to the left) should be assumed by all occupants. Both hands should be placed behind the head with the fingers locked together. The elbows should be pulled forward to protect the side of the head and face. The upper torso should be erect. Though the descent rate of about 14 to 17 miles an hour is typically not severe in most situations, the exact angle of impact, coupled with an aircraft still oscillating under canopy, could cause the landing touchdown to be sufficient to cause injuries or worse.

NOTE: The exact speed of descent cannot be determined ahead of time due to many variables involved. For more details, see the precautionary information in the section called “LIMITATIONS OF BRS SYSTEMS.”

Note: Stunt car drivers use a technique of pulling themselves forward to and holding onto the auto’s dashboard. This keeps them from slamming into it, and largely avoids injury to them. A similar tactic may be considered if it might work in your particular aircraft.

In addition to vertical velocity, the aircraft may still be oscillating (see above) and the wind may be causing significant amounts of drift. Try to consider the direction of such movements just before touchdown occurs.

If so equipped, move seats to the rear to gain maximum distance from instrument panel and controls. Open doors prior to touchdown to ensure they can't be jammed shut by possible distortion of fuselage due to impact.

Post-Touchdown Activities

Once the aircraft has contacted the ground, and after you've checked for injuries that might be worsened by moving, plan to extricate yourself as quickly as possible. In some threatening cases, it may be best to move even if injuries are present; this decision must be made by the pilot and his/her passengers.

Exiting the aircraft while in a stressful environment may not happen mechanically. It is recommended that you (and your passengers!) practice escape techniques before any actual need occurs. After touchdown, allow the aircraft to come to a complete stop before getting out unless its apparent that the aircraft is being dragged towards danger.

Upon exiting the aircraft, move to the upwind side to keep from being injured by the moving aircraft if the canopy were to re-inflate.

If you should end up in power lines (carrying electrical current), *do not under any circumstances* touch any metal parts. Also shout this precaution to anyone attempting to help you. If a rescuer touches a metal part of the aircraft while he stands on the ground, he could be electrocuted. Confine your movements until qualified personnel can come to your assistance.

If in the event of a water landing, doors should be propped prior to water contact.

5. Other Safety Item Suggestions

As a company specializing in safety products for airplanes, BRS would be remiss in not also advising the use of related safety products. Three devices come to mind in conjunction with the BRS unit.

BRS recommends that all pilots wear a helmet while flying open-cockpit aircraft. If the aircraft structure of an enclosed aircraft is not "friendly" to humans, that is, if care has not been exercised in the design, a rough accident might cause the head to strike portions of the aircraft. In all such situations, a helmet is advised, *if* that helmet meets current acceptable ratings for cranial protection. A helmet can also do double duty as protection against ear damage caused by continuous noise and, if foam filled, as a floatation device for water touchdowns.

It is also recommended that you reconsider the accessibility of your aircraft's kill switch. (Some aircraft do not refer to the engine shut down as a kill switch.) In a high stress environment you may fumble for an engine shutoff switch. Countering the need to have the kill switch accessible in all in flight postures is the need to keep it somewhat hidden from tampering passengers or curious children.

A last item on the safety list is fire extinguishing equipment. This may seem a weight and cost penalty until you think of the chance of an in-flight fire.