BMAA TECHNICAL INFORMATION LEAFLET (TIL)

TIL 063 ISSUE 2.1

BALLISTIC PARACHUTE RECOVERY SYSTEMS

Contents

1. Introduction

A Ballistic Parachute Recovery System (BPRS) is a parachute system designed to recover the airframe and occupant(s) to the ground in an emergency. This leaflet contains important information for pilots, owners and BMAA Inspectors of BMAA aircraft fitted with a BPRS. It also contains information for designers of BPRS installations in BMAA aircraft in the Appendix.

Although primarily a safety system, the UK Microlight definition contains a 5% Maximum All Up Weight (MAUW) allowance for a landplane fitted with a BPRS (e.g. up to 472.5kg for a two-seat Microlight with a BPRS compared to 450kg without, and up to 315kg from 300kg for a single-seat Microlight). Note that this allowance is only in the Microlight definition; a particular aircraft type can only take advantage of this if it has been designed (and is approved) to operate at the higher weight.

BPRS is currently the favoured generic term for this kind of system. Although they are often called BRS, this is a genericised trademark of BRS Aerospace. In the UK Air Navigation Order they are described as Airframe-Mounted Total-Recovery Parachute Systems (AMTRPS).

This document (at issue 2) was issued in November 2018. It is a general overhaul of issue 1, which was issued in July 2011. Issue 2.1 is a minor update issued in April 2019 subsequent to the exterior placard requirements being confirmed in BCAR Section S issue 7 and their fitment mandated by MPD 2019-005. Comments or queries on this document should be emailed to technical.office@bmaa.org.

1.1. Important safety warnings

A BPRS could save your life. However, pilots should be aware that:

- Despite their best efforts, installation designers can't be expected to consider all eventualities, or design a BPRS installation that can safely recover the aeroplane in all emergency circumstances.
- Even after a successful deployment, control is largely lost and the subsequent trajectory and impact point is out of the control of the pilot. Some rudder effectiveness may remain in a 3-axis control aircraft.
- Even if landing on relatively good terrain, due to the high descent rates the risk of serious injury or death in the ground impact is not insignificant.

In conclusion, it is generally accepted that a BPRS is another chance when all others have evaporated; the system should only be deployed if the chance of a survivable forced landing is otherwise remote.

In the UK, a BPRS installation is approved on the basis that - whilst not deployed - it will not hazard the aircraft, its occupants or ground personnel. The UK approval process does not consider deployment of the system and whether it can safely recover the aircraft. Therefore, UK approval should not be taken as any kind of guarantee that the system will work as hoped.

If the BPRS is accidentally fired on the ground, the rocket has the potential to cause serious injury or death to anyone in its way. (It will also damage the aircraft and, if outside, any wind is likely to inflate the parachute and drag the aircraft causing further damage as well as risking injury to anyone in or near the aircraft.) Therefore, the system should only be armed for flight: do not remove the safety pin until the occupants are secured in the aircraft, and replace it before the occupants depart the aircraft after flight. Add these actions to pre-take-off and shutdown checklists.

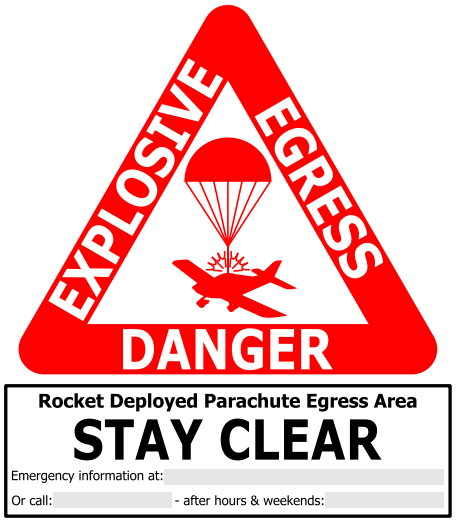
2. Airframe and BPRS markings

In 2014 there was a fatal accident to SportCruiser G-CZAW, which was fitted with a BPRS. Although the BPRS was neither deployed nor caused the accident, the Air Accident Investigation Branch (AAIB) report raised concerns about the marking of aircraft fitted with BPRS, and made various recommendations (AAIB Report EW/C2014/08/01 in Bulletin 5/2015). These recommendations are primarily aimed at minimizing the hazard by improving the information available for the emergency services, first responders and members of the public who attempt to assist the occupants in case of an accident.

The UK Civil Aviation Authority (CAA) has subsequently reviewed and updated its warning placards, which are contained in BCAR Section S issue 7. These requirements are heavily based on the FAA (USA) and EASA (EU) requirements for BPRS in Light Sport Aircraft. Fitment of these placards - to aircraft already fitted with a BPRS as well as new aircraft and new fitments - is mandated by MPD 2019-005. Note that this document is only a guide; see BCAR Section S and the MPD for the definitive requirements (including minimum placard sizes).

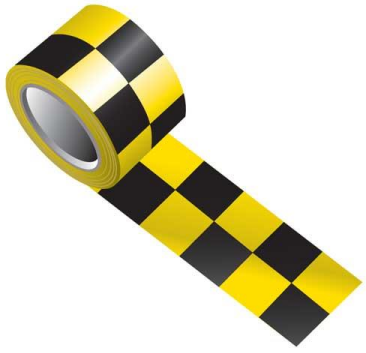
2.1. Rocket egress danger placard

This placard should be applied on, or adjacent to, the area where the rocket will exit the airframe. Ensure the BPRS manufacturer's emergency website and telephone numbers are clearly and indelibly marked on the placard. The emergency website and telephone numbers are usually easy to find on the BPRS manufacturer's website.



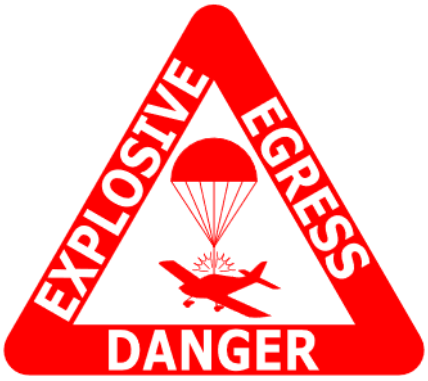
2.2. Parachute egress identification marking

The edges of the hatch or panel through which the rocket will exit the aircraft should be highlighted using black and yellow hazard tape - minimum width 20mm. Ensure that the tape does not reinforce any frangible panel (which could hinder exit of the rocket)!



2.3. General danger placards

These placards should be applied to the aircraft close to the BPRS system, and used as required to ensure that at least one is visible even if the aircraft comes to rest on its back (or other possible post-accident attitude).



2.3.1. Danger placard location guidance

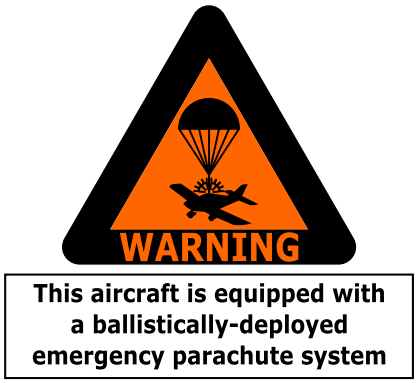
The BMAA Technical Office is happy to provide individual guidance on placard location.

For 'typical' 3-axis control aeroplane BPRS installations, the following locations are normally satisfactory:

- For an aircraft where the BPRS exits the top of the fuselage, the rocket egress danger placard (Section 2.1) should be placed on the top of the fuselage (on, or adjacent to, the exit area). Two general danger placards (Section 2.3) should be fitted, placed on each side of the fuselage close to the BPRS installation.
- For an aircraft where the BPRS exits the side of the fuselage, the rocket egress danger placard (Section 2.1) should be placed on the side of the fuselage (on, or adjacent to, the exit area). One general danger placard (Section 2.3) should be placed on the other side of the fuselage opposite the rocket egress danger placard.

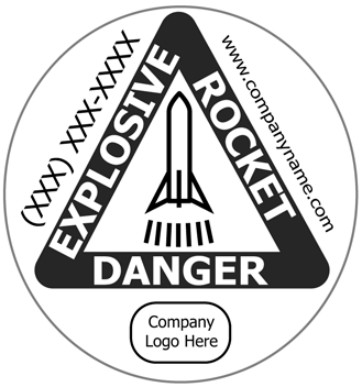
2.4. Occupant warning placards

These warning placards should be applied to the aircraft adjacent to the doors, or places where the occupants enter the aircraft.



2.5. Rocket danger placard

The BPRS system itself should have a danger placard fitted (proprietary placard provided by the BPRS manufacturer). Note that the example below is purely an example to indicate the intention (taken from ASTM F2316-12).



2.6. Release warning placard

Note that the release handle will already have a warning placard of the form below. Ensure that this is in place.

WARNING – EMERGENCY PARACHUTE
(Action to be taken)
Unapproved Equipment – see Pilot's Handbook

Note: the text '(Action to be taken)' is a placeholder for specific instructions on how to deploy the system.

3. Mandatory maintenance

A BPRS installation should be maintained in accordance with the approved maintenance requirements (the maintenance requirements that were approved by the BMAA or CAA when the BPRS installation was approved). These will normally be based on the BPRS system manufacturer's maintenance requirements, but might include some installation-specific maintenance actions (specific to the particular aircraft, or aircraft type, the system is installed in).

The BPRS system manufacturer's maintenance requirements normally involve inspecting and repacking the parachute after a specified number of years, and reconditioning or replacing the rocket after a specified number of years (which may not be the same as the parachute repacking period).

Maintenance actions that affect the rocket of the BPRS installation are mandatory and must be performed. An aircraft with a time-expired rocket may not be flown until the rocket has been reconditioned or replaced (as required), or alternatively removed from the aircraft. The reason for rocket maintenance being mandatory is that a time-expired rocket could be unstable and is therefore a potential hazard in normal flight (not only when the system is activated in an emergency). It therefore no longer meets the basic requirement of UK approval (see Section 1.1).

3.1. Flight with a BPRS system temporarily removed

If a BPRS system is temporarily removed (or partially removed) for a short period of time for maintenance, the aircraft may still be flown subject to the following:

- If the BPRS activation handle remains in place it must be clearly marked as unserviceable.
- A BMAA Inspector must generate new weight and balance forms for the aircraft with the system removed. If the aircraft is a Microlight with a MAUW exceeding 450 kg (e.g. 472.5kg), MAUW must be reduced to 450kg for the period the system is removed. The new weight and balance forms must be submitted to, and be signed-off by, the BMAA Technical Office.
- Placards (including the cockpit load versus fuel trade-off placard) must be updated for the new empty weight and any change in MAUW.

3.1.1. Permanent removal

A two-seat Microlight with a MAUW exceeding 450 kg (e.g. 472.5kg) may only have the BPRS system permanently removed if the aircraft can continue to comply with the basic empty weight requirement for the type at 450kg. Contact the BMAA Technical Office for further advice.

Appendix 1 – information for installation designers

The UK Civil Aviation Authority (CAA) require BPRS fitments to comply with the airworthiness requirements of BCAR Section S sub-section K – Microlight Parachute Recovery Systems. This leaflet describes the BMAA's interpretation of these requirements.

A1.1. CAA position

The CAA's position is that BPRS should be approved on the basis that, whilst not deployed, they will not hazard the aeroplane, its occupant(s) or ground personnel. The CAA does not require the circumstances, if any, in which the system might be deployed, and, if deployed, whether the system is effective in safely recovering the aeroplane, to be considered.

A1.2. Installation designers' responsibilities

Installation designers (i.e. applicants) should be aware that the CAA's position does not mean that they (the installation designers) do not necessarily have a duty of care to a user who deploys his BPRS. Should a BPRS fail to satisfactorily recover an aircraft (from a situation in which the user could reasonably expect satisfactory recovery) a court may find the installation designer to have been negligent.

BCAR Section S AMC S 2003 advises installation designers to consider deployment of the system – see section 3. However, the AMC S 2003 only provides a list of points to consider; not a set of requirements. Installation designers may consider consulting foreign airworthiness codes that do place requirements on system deployment for guidance.

A1.3. BMAA role

The BMAA's role (for which it is approved by the CAA) is to certify to the CAA that a BPRS fitment complies with the airworthiness requirements provided by the CAA for the purpose. It is not the BMAA's role to invent or adopt airworthiness requirements outside of the scope considered appropriate by the CAA. The BMAA advises installation designers that, despite the CAA's position, they may be considered to have a duty of care to a user who deploys his BPRS – see section A1.2.

A1.4. Acceptable Means of Compliance with S 2003 (AMC S 2003)

BCAR Section S requirement S 2003 states:

> *"It must be shown … that: a) the airworthiness of the aeroplane … will not be degraded by the … system; and b) the installation has been designed to minimise the risk of inadvertent … deployment … ."*

However, AMC S 2003, in addition to describing acceptable means of compliance with this requirement, provides advice to the installation designer unrelated to this requirement!

Below, marked with a tick (✓) are those parts of AMC S 2003 that are acceptable means of compliance with requirement S 2003, and marked with a cross (✗) those parts that are advice to the installation designer.

When assessing a BPRS installation the BMAA will not consider those parts marked with a cross (✗).

1	the ability of each seat and restraint system … to protect the occupant(s) from serious injury …	×
2	the ability of the attachment point[s] … to withstand the loads arising from a worst case correct deployment	×
3	minimising the possibility of parachute entanglement with parts of the aeroplane during deployment …	×
4	the attitude that the suspended aeroplane will adopt …	×
5	the ability of the parachute to fulfil its intended purpose	×
6a	the security of the mounting to take account of … heavy landings or taxiing on rough terrain	✓
6b	the routing of the release cable …	✓
6c	the design of the release control …	✓
6d	the positioning of the release control so as to minimise the snagging hazard …	✓
6e	the positioning of the release control to make it accessible to both pilot and passenger …	×
6f	the provision of a safety pin … to prevent unintentional deployment	✓

A1.4.1. AMC S 2003 6c

AMC S 2003 6c states:

> *"The release action should take the form of two separate and distinct actions that can be carried out quickly and with one hand, such as a twist and pull action. For systems incorporating a single action release mechanism, compliance with S 2003 may be acceptable provided that the release control is fitted with a stowage that either provides the additional action or is designed to minimise the possibility of snagging from clothing, personal equipment, or by parts of the aeroplane."*

The BMAA considers this to be an acceptable means of compliance with requirement S 2003 b, which requires the risk of inadvertent deployment to be minimised, not a requirement in itself. In particular, the interpretation of what does, or does not, constitute a 'stowage' will be based primarily on the snagging risk, rather than the existence of a conventional stowage (box-like compartment) for the release control. For example, a release action consisting of two separate and distinct actions may not be considered necessary in an enclosed 3-axis control aeroplane, with the release control situated between the seat backs or adjacent to the roof at the rear of the cockpit, where the snagging risk is considered very low.

Note that if the release action is too complex this increases the risk of a failed deployment in a confused, or high acceleration, loss of control situation. If the release action is too complicated this increases the risk of a failed deployment by a passenger in case of pilot incapacitation.