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Technical Safety Note 2020-1

Wrong installation of emergency parachute on Zenair Zodiac CH-601

Addressee(s):

Aircraft owners of Zenair Zodiac CH-601

Applicability:

Zenair Zodiac ultralight airplanes manufactured by Czech Aircraft Works, s.r.o. (CZAW) and equipped with an emergency ballistic recovery parachute system (BRS Aerospace or other) installed **in front of the cockpit.**

Reason for this note:

Further to the safety investigation (AAIU reference 2019-06-22-01) of an accidented ultralight airplane model Zenair Zodiac CH-601-XL, an anomaly was found in the installation of the BRS Aerospace BRS-6 (Model 1050) ballistic recovery parachute system fitted between the cockpit dashboard and the engine firewall. During the accident, the parachute was activated by the crew seconds before impact. However it was not able to deploy as intended, due to an incorrect installation[1]. After analysis, the investigation concluded that such an incorrect installation could result in an inadequate deployment impairing the safety of the aircraft's occupants.
This safety note has been written with the aim to draw the attention of the Zenair Zodiac owners to the hazard of an incorrect parachute installation and to advise them to make the system verified by a specialized technician.

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Revision number:

N/A

[1] the installation was performed by Czech Aircraft Works, s.r.o. (CZAW). They are no longer in activity, but were located in Lucni, Czech Republic and manufactured Zenair Zodiac airplanes from mid-nineties to 2009 with emergency ballistic recovery parachute system installed during manufacture as an option.

1. INTRODUCTION

There are 2 options for installing the rocket-propelled emergency parachute on the Zenair; either on the back or on the front. This Technical Safety Note concerns the installation at the front.
In that configuration the system, comprising the parachute and a propelling rocket, is installed in a compartment between the engine firewall and the cockpit dashboard. This compartment is closed by an indented egress (or blowout) panel riveted on the fuselage skin. The holes in this panel are slotted; there's an opening cut from the hole to the panel's edge to facilitate its opening after the rocket is fired.
The system comprises 3 straps (also called harnesses) attached to 3 internal structural points of the fuselage. The 2 front harnesses are respectively attached to the right and left lateral side of the front compartment, and folded next to the parachute bag. The third (rear) harness is attached aft of the cockpit at the righthand side of the aircraft structure by means of a cut-out (access hole) in the fuselage. The other ends of all 3 harnesses are connected to the parachute in the bag in the forward compartment.

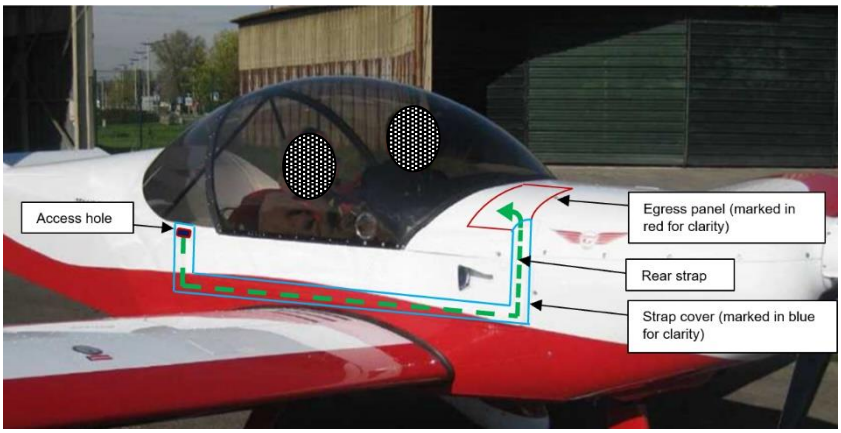

Figure 1: Correct installation of the front emergency parachute. The green dotted line shows the routing on the fuselage of the rear strap

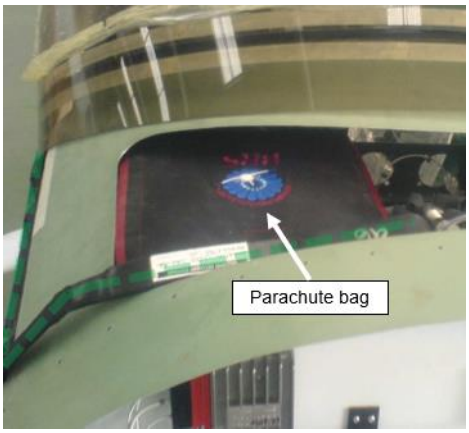

Figure 2: rear strap running on the fuselage with cover removed

The rear harness (green dotted line on Figure 1) runs along the righthand fuselage side and comes into the front parachute compartment under a protective strap cover (blue line).

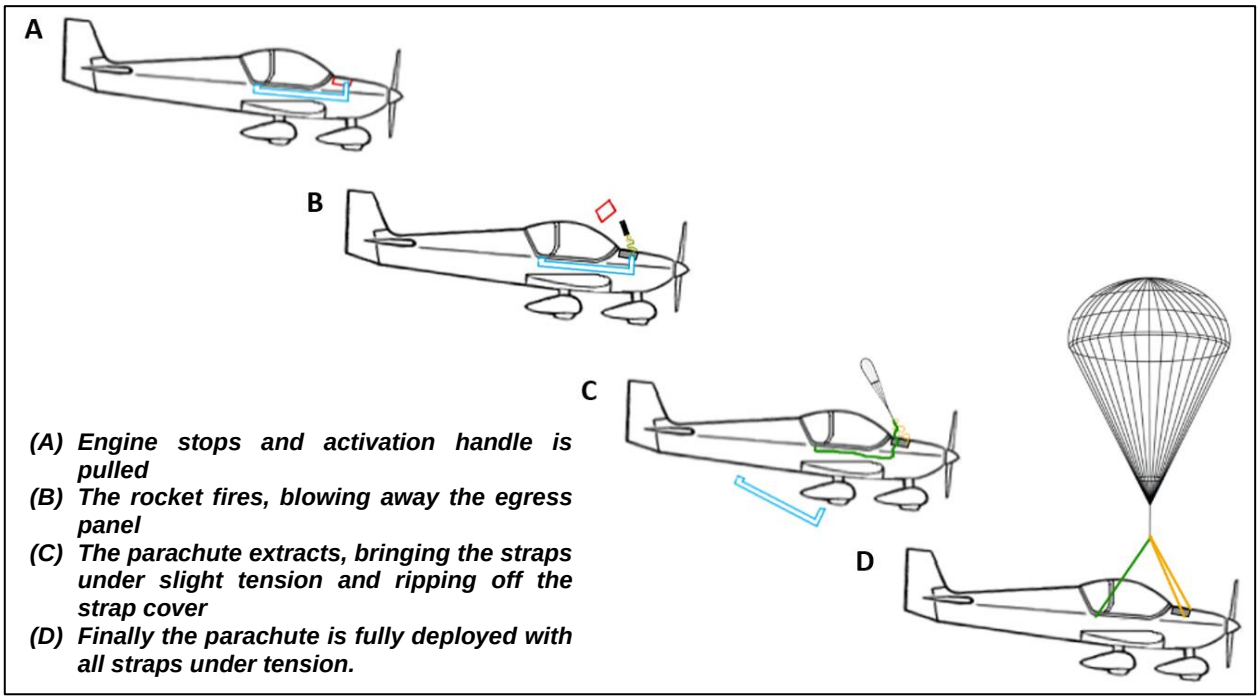

Figure 3: Deployment sequence

The strap cover of the rear harness goes to the base of the parachute blow out (egress) panel, where the harness enters in the parachute compartment through a cut in the corner of the blow out panel. This configuration allows the rear strap to extend fully and freely above the cockpit when the system is activated. In this way, the airplane will hinge through 3 structural anchored points with its center of gravity below the parachute, with all 3 straps completely stretched.

2. DIFFERENCE BETWEEN INCORRECT AND CORRECT INSTALLATION

2.1 Incorrect installation of the parachute system at the front

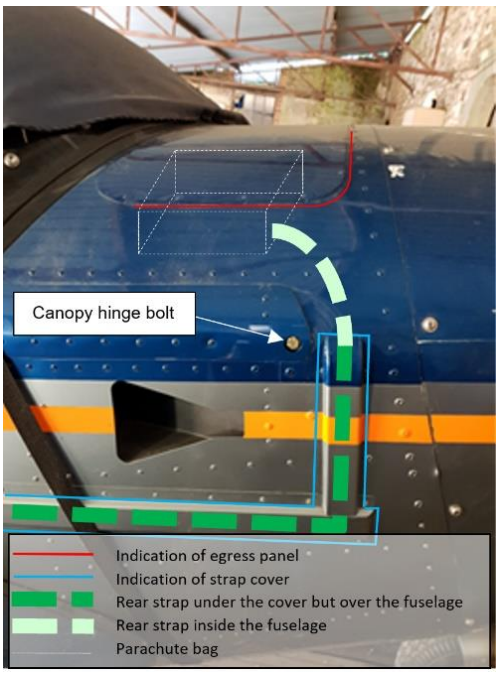

Figure 4: Incorrect installation

Figure 4 shows the abnormal rear harness routing inside the front parachute compartment encountered on the installation performed by CZAW. The rear harness comes into the parachute compartment through a hole cut in the riveted fuselage skin at the level of the canopy hinge bolt[2]. This installation holds the rear strap under the fuselage skin of the parachute compartment, leading to a strap partially captured in the front fuselage structure and thus not able to extend above the cockpit when the system is activated.

This **incorrect installation can easily be identified** on a Zenair Zodiac ultralight airplane when the fuselage shows **a strap cover that ends its installation at the level of the canopy hinge bolt** without reaching the lower corner of the egress panel.

2.2 Correct installation of the parachute system at the front

Figure 5 illustrates what should be the travel, on the external fuselage skin, of the rear strap into the parachute compartment. It should come inside the compartment through the cut of the blow out panel corner (indicated red on Figure 5, encircled yellow on Figure 6), the panel corner hole being covered and sealed by the end of the harness strap cover that must reach the edge of the blow out panel (indicated blue). This routing allows the rear harness to extend full and freely above the cockpit and, concurrently with the 2 front harnesses, to anchor the parachute around the centre of gravity of the airplane, completely under tension.

[2] An access hole at that location should only be made and used in the case that the parachute assembly is installed at the back and the strap is anchored at the front structure via that access hole.

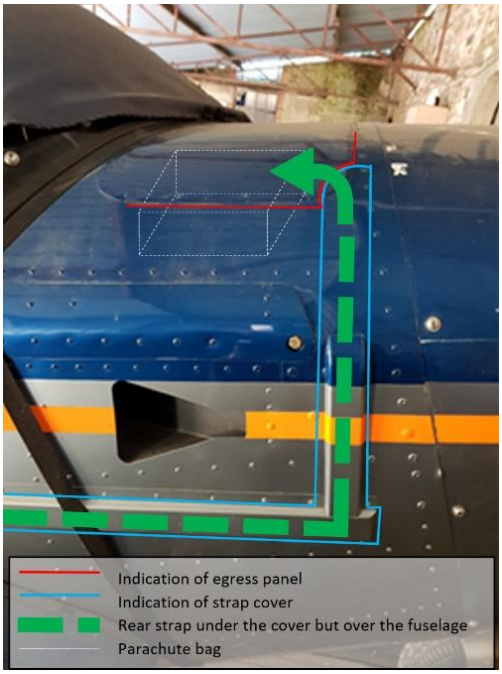

Figure 5: showing how the correct installation should be like

Figure 6: picture taken from an installation inside showing the hole in the egress panel

3. HAZARDS

The abnormal installation of the rear harness has been observed by the AAIU(Be) on 4 Zenair Zodiac ultralight aircraft (CH-601-XL & UL) built and modified by CZAW.

In this configuration, after extraction of the parachute, the rear harness of the parachute remains retained along the fuselage as well as in the structure at the front of the aircraft (being captive in the fuselage cut-out located in front of the bolt of the right canopy hinge). As a result, the rear harness is unable to extend normally over the cockpit. Because of its shortened length, the aft harness is the only one of the three harnesses that will be submitted to the tensile force developed by the deployed parachute. In the accident aircraft, investigators found the two front straps still folded and held by their nylon clamp (storage position).

This situation:

- may bring the aircraft in an undesirable and unrecoverable attitude during parachute deployment, and
- may not generate the desired slowing-down effect because the parachute may not be able to deploy as intended.

So this can bring the aircraft in an even more dangerous configuration than the situation before the parachute was deployed.

Moreover can friction damage caused by the metal fuselage skin on the rear strap during extraction (as observed by the AAIU(Be) investigators on the accident airplane) lead to rupture of that rear strap causing on its turn other secondary effects.

4. SAFETY MESSAGE :

The AAIU(Be) advises all owners of a Zenair ultralight airplane equipped with an emergency ballistic recovery parachute **in front of the cabin** to :

- before the next flight, **check the routing of the rear harness** into the front parachute compartment, and verify if the rear harness strap cover reaches the front corner of the parachute compartment blow out (egress) panel as shown in Figure 5 and Figure 6 (correct installation);
- if not (like observed in Figure 4) or if any doubt, contact either the airplane manufacturer[3], or the parachute system manufacturer or any specialist in emergency parachute system installation **for a safe re-installation of the rear harness**;
- **strictly comply with the instructions** and documentation of the aircraft manufacturer or the manufacturer of the emergency parachute system concerning the installation, as well as any maintenance and servicing to be carried out on the emergency parachute equipment installed on board the aircraft.

[3] Compliant plans for the installation of a ballistic recovery parachute kit in front of the cockpit are currently (at the date of publication of this Note) available for sale for Zodiac CH601XL (UL) / CH650E models on the website of Zenair Canada.