Parachute Tutorial

1. Introduction

The **starcopter HIGHDRA** can be equipped with a **DRS parachute recovery system** for enhanced flight safety. This system ensures a controlled descent in emergency situations and is designed to protect both the drone and its surroundings by reducing the kinetic impact energy. The parachute system uses a **remote trigger mechanism** with a separate transmission path that can deploy the parachute.

This tutorial explains how to install, operate, and maintain the parachute system safely and effectively.

2. System Overview

2.1 Components

The parachute system includes the following components:
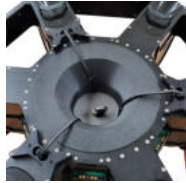
Name	Picture	Description
Container		Carbon container of the DRS system
Container Lid		Lid of the container.
Parachute		Parachute (wrapped in a protective cover secured by some rubber bands).
Cords (4)		Cords mounted to the UAV. Three cords come pre-installed with the drone. One replacement cord is in the box.

| Carabiner | | Carabiner to link the parachute to the parachute cords. The carabiner comes pre-installed with the drone. |
| Foam (2) | | Round foam cover for central cord opening. One of two foams comes pre-installed with the drone. |
| Emergency Trigger | | Handheld radio controlled (RC) transmitter and antenna to deploy parachute in case of emergency. |

2.2 Describe how the Parachute System is on the HIGHDRA

After unpacking and setting up your starcopter HIGHDRA with the integrated DRS parachute system, the setup should look similar to the image below.

This view provides a first impression of how all components fit together before you begin installation or handling.
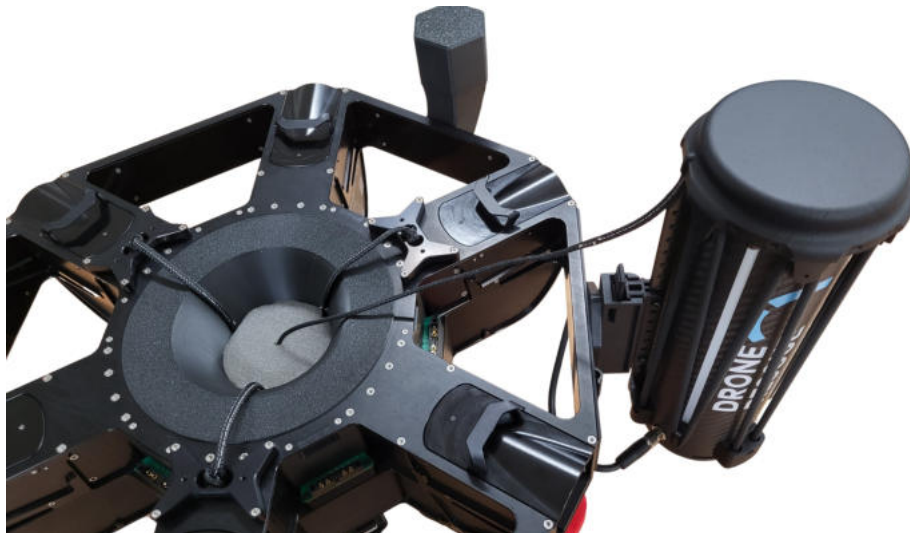
3 Setup and (Re-) Loading

This section describes how to load and install the parachute onto the drone. Perform all steps in a clean and stable environment.

3.1 Delivery Condition

Your **Starcopter HIGHDRA** arrives with the basic parachute mounting setup pre-installed on the drone.

- **Three parachute cords** are mounted on the airframe and connected to the **carabiner**.
- A **round foam ring** is placed below the carabiner on the cords.
- The **foam cover** is installed in the **center opening** of the drone, with the carabiner protruding from the middle.

The following components are supplied separately in a dedicated box:

- **Parachute (packed in protective cover)**
- **Parachute container**
- **Manual trigger device**

3.2 Installation and Loading the Parachute

Follow these steps to safely install and load the parachute:

Picture	Description
	Remove the **container lid** and place the container on a **flat, solid surface**.

Open the **release mechanism** (the small white shutter at the bottom). The easiest way to do so is to get underneath the shutter with your fingernail and lift it to the end stop. Lift it approximately 90°.

While holding the **shutter** open, use a **solid object** (such as a plastic pipe or the drone's landing leg) to **press the catapult platform fully downward**.

This step requires **considerable force**. For safety and ease of handling, it is recommended that **two people** perform this action — one person holding the shutter open and the other pressing the platform down with the plastic pipe using both hands..

You can confirm that the catapult platform is **fully pressed down** when the **rubber holders on the outside sit completely at the bottom** of the sliding guide.

While maintaining pressure, **close the shutter** until it is no longer sticks out of the container tube.

Slowly release pressure from the platform.

> ⚠️ Caution:
>
> If the shutter is not fully closed, the parachute may deploy unintentionally, causing injury or damage.

Remove the rubber band from the parachute, keeping the **protective cover closed**.

Insert the parachute into the container **with the jagged edge first**. Put it fully into the container.

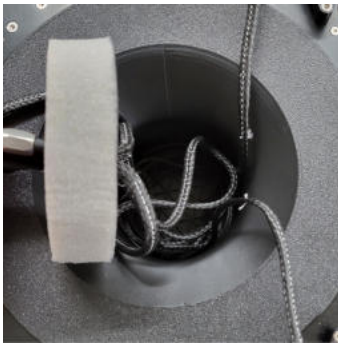Slide the container into the **mounting rail** at the **8 o'clock position** on the drone.
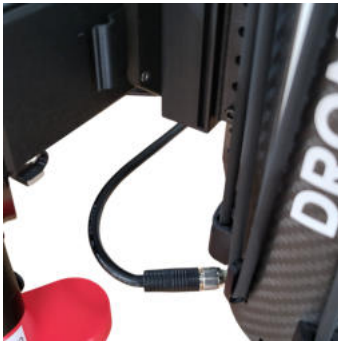
Connect the **trigger cable** from the drone mount (left to the mounting rail) to the parachute container.

Feed the **parachute cord** through the **round foam ring**.

Attach the parachute cord to the carabiner where the three UAV cords are already attached.

Roll up the **loose UAV cords** and place them inside the **central opening** of the drone. This step is already completed in the **delivery state** and only needs to be repeated if the **foam insert has been removed**

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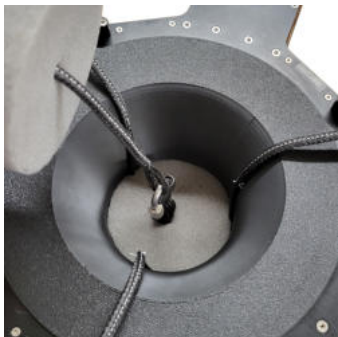
Cover the rolled-up cords with the **foam layer**, ensuring that only the **carabiner** rests on top. This is also pre-installed at delivery and only needs to be redone if the **foam was removed.**

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Roll up all loose cords from the parachute over the carabiner.
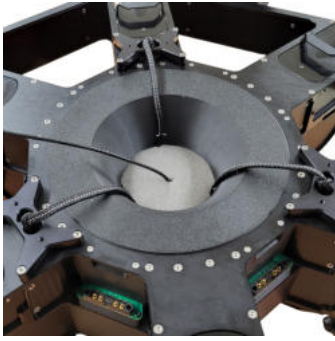
Cover the opening with the foam ring. The cord between the parachute and the top of the foam should be tight enough to prevent entanglement.

Re-install the **container lid**, ensuring the cord exits through the designated opening.

4 System Indicators (LED and Device States)

Familiarize yourself with the indicator lights on both the container and trigger device before flight.

4.1 Parachute Container

Color	Description	User action
blinking purple	system is booting	wait until done
blinking blue	waiting for man.dep.	turn on manual triggering device
blinking cyan	waiting for mavlink interface; not working communication between parachute and flight controller	do not take off; contact starcopter
blinking yellow	warning	do not take off; check logfile or contact starcopter
blinking red	error	do not take off; check logfile or contact starcopter
blinking green	ready for takeoff	take off when you are ready
cycling through all colors	parachute deployed	

4.2 Manual Trigger Device

4.2.1 Power LED

Color	Description
green	battery good

Color	Description
yellow	battery medium
red	battery low
blinking red	battery bad
blinking blue	deployment initiated

4.2.2 Connection LED

Color	Description
blinking purple	connection pending
green	connection good
yellow	connection low
blinking red	connection bad
blinking blue	deployment initiated

5 Flight Operations

This section guides you through the operational phases — before, during, and after flight.

5.1 Pre-Flight Checks

Perform these checks before every flight:

Before each flight, ensure the parachute system is properly installed and ready:

1. Verify the parachute is correctly loaded and all cords are secured.

2. Power on the drone.

3. Switch on the **manual trigger device** and check the **battery status**.

4. Confirm **green connection indicator** on the trigger device (indicates stable link).

5. Ensure the **parachute container LED** blinks green — ready and connected.

6. The system can now be armed and is ready for takeoff.

5.2 In-Flight Operation and Deployment

Keep the **manual trigger antenna** at least **20 cm away** from your body during operation.

There are two ways to deploy the parachute:

1. **Manual Trigger Device**

   - Press **both buttons simultaneously** to trigger deployment.

   - Pressing only one button will sound a **warning tone**.

   - The parachute can deploy **in flight or on the ground**.

2. **Herelink Remote**

   - Press the **KILL** button to stop motors and deploy the parachute.

   - This function works when the drone is **armed**, both on the ground and in flight.

> Both methods stop the motors and deploy the parachute immediately. In **Auterion Mission Control (AMC)**, a message confirms deployment. The container LED will cycle through colors and a buzzer emits a loud warning

> tone.

5.3 Post-Flight Procedure

Perform the following checks and steps after flight to keep the parachute system safe and ready for future missions.

5.3.1 After each flight

1. Observe the **LED patterns** on the parachute container and trigger device.

   - If an error pattern or warning color appears, refer to *Section 4 System Indicators*.

2. Perform a **visual inspection** of the parachute system:

   - Check cords and fabric for twists, tangles, or damage.

   - Verify that the container lid and shutter remain properly seated

   - Ensure cables and connectors are secure.

If the parachute was deployed, perform the **Resetting After Deployment** procedure (see Section *3.2 Installation and Loading the Parachute*) before the next flight.

5.3.2 After Flight Day / Before packing the drone

Before packing the drone into its transport case:

1. **Power off** the drone and remove all batteries.

2. **Switch off** the manual trigger device.

3. Wait a few seconds to ensure that all LEDs are off and that the system is fully powered down.

To fit the drone into the transport box, the **parachute container must be removed**.

Follow the steps below only when the drone is powered off.

5.3.2.1 Removing the Parachute Container for Transport

1. Unplug the **parachute trigger cable** and secure it in its holder.

2. Disconnect the **parachute cord** from the **carabiner**.

3. Press the **shutter** of the mounting rail and **slide the container upward** to remove it from the drone.

4. Place the container carefully in its **designated slot** in the transport box.

5. Ensure the parachute cord and carabiner remain untangled and safely stowed.

> ⚠️ Only remove the parachute container when the drone is completely powered off.

6. Maintenance & Testing

6.1 Maintenance

Recommend maintenance once a year, which needs to be done by Drone Rescue Systems GmbH or a certified partner of Drone Rescue Systems GmbH. For further information, please contact starcopter.

Maintenance includes:

- Repacking of the parachute

- Replacement of the plastic cover

- Replacement of the elastic rubber springs
- Replacement of the parachute cords

6.2 Testing

A **system test** must be performed approximately **every 50th flight** to verify that the parachute deployment mechanism and automatic motor shutdown are functioning correctly. This test simulates a deployment using a **dummy payload** instead of the real parachute.

> ⚠️ Conduct the test **outdoors only**, in a **clear area** with no people, animals, or obstacles close by. During the test, the drone must remain on the ground with motors running — do **not take off**.

6.2.1 Test Preparation

To confirm correct operation of:

- Parachute trigger mechanism
- Motor cutoff system
- Deployment signals (LEDs, buzzer, and AMC message)

Required equipment:

- Dummy payload weighing approximately **330 g** (same as parachute).

  A partially filled **0.5 L water bottle** works well as a substitute.
- Manual trigger device
- Clear outdoor area with stable surface

6.2.2 Test Procedure

- **Prepare the container:**
  - Follow the regular *Installation and Loading the Parachute* steps,

    but instead of the parachute, place the **dummy payload** inside the container.
  - Leave the **container lid removed** so the payload can exit freely.
- **Position the drone:**
  - Tilt the drone **slightly away from yourself and any objects** by placing a small block or tool under one landing leg.
  - Ensure that when triggered, the dummy payload will **not strike the drone** or anything or anyone nearby.
- **Power on systems:**
  - Power on the drone and the manual trigger device.
  - Confirm that all system indicators show **ready status** (see *Section 4 — System Indicators*).
- **Perform the pre-flight checks:**
  - Follow the standard *Pre-Flight Procedure* for both the drone and parachute system.
- **Arm the drone:**
  - Arm the drone via the Herelink remote control.
  - Keep the **throttle stick in neutral position** to prevent takeoff.

- Do not give any stick inputs.
- **Trigger the parachute:**
  - Use the **manual trigger device** to activate the system by pressing both buttons simultaneously.
  - The dummy payload should be ejected approximately **5 m** from the drone.
- Turn off the drone

6.2.3 Verification

☐ Motors shut down immediately

☐ Dummy payload was ejected cleanly

☐ Parachute container LED cycles through all colors (Deployed state)

☐ Continuous loud warning tone sounds

☐ Parachute Deployed message shown; flight state changes to **Flight Termination**

6.2.3.4 After the Test

1. **Power off** the drone and the manual trigger device.
2. **Inspect** the container and connectors for damage or residue.
3. **Reload** the real parachute before the next flight mission.

7 Storage

If the parachute will not be used for an extended period:

- Unload the parachute, see (7.1)
- Store all components in a **dry environment**, away from direct sunlight or extreme temperatures.

7.1 Unloading

Unload the container when storing the drone for longer periods or when the system will be serviced.

1. Remove the **container lid**.
2. Take out the **parachute**, re-secure it with the **rubber bands**
3. Set the **container** on a **flat, solid surface**.
4. Use a solid object (e.g., plastic rod or similar tool) to **hold the catapult platform under tension.**
5. While holding the platform down, **open the shutter carefully**. Be prepared: Once the shutter opens, you need to use a lot of strength to control the spring relief.
6. **Slowly release** the platform until the spring tension is fully relieved.

> ⚠️ Do not allow the platform to snap upward without load — this can damage the spring mechanism.

When tension is released and the parachute removed, the container can be stored safely until the next loading procedure.

8. Technical Specifications

8.1 Parachute Container

Specification	Value
Service life (before repack required)	1 year
Supply voltage range	20 V to 25 V
Maximum altitude above sea level	3000 m
Temperature range for normal operation	-5°C to +40°C
Temperature range for reduced operation time under harsh conditions (up to 1 hour, storage and operation time)*	-20°C to +40°C
Overall weight DRS-25	600 g
Maximum number of deployments**	10
IP-rating	IP00 (none)

⚠️ *Exposure to temperatures below -5°C for one hour may decrease the elasticity of the rubber bands and lead to slowed parachute ejection and delayed canopy deployment. The system recovers after resting within normal temperature range for two hours.
**not including test deployments

8.2 Manual triggering device:

Specification	EU variant
Operating frequency	868 MHz
max. RF power	25 mW
current consumption (@9V)	130 mA
Tested range	2000 m
Power supply	9V battery (PP3 size)
average battery life	≈ 4 h
Dimensions	133×80×33 mm (without antenna)