

## UxV/35 Sturnus Dropper Mission Test Procedure

### Introduction

This document provides a test procedure for confirming a functional drone and dropper prior to a dropper mission. The document is specific to the UxV/35 Sturnus and its onboard safety systems.

The test procedure is broken into four modules to test and verify multiple Sturnus drones in an assembly line.

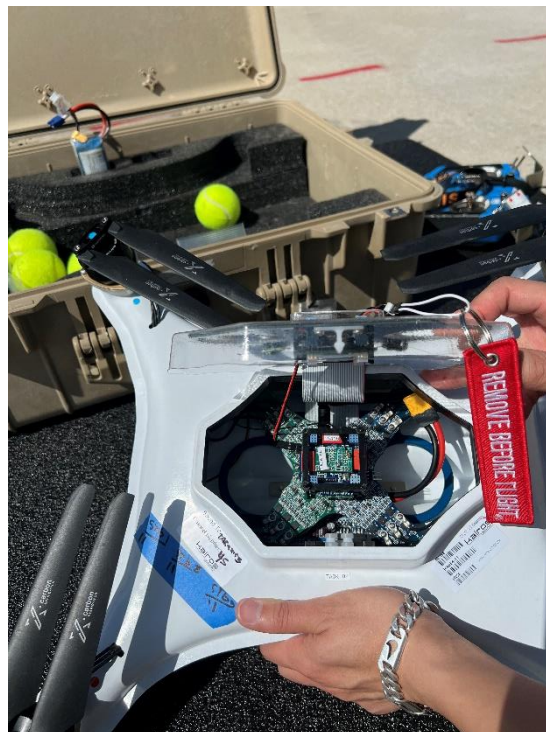
### **IMPORTANT!**

**Follow this procedure in this exact order shown to ensure safety at all times.**

## TEST STAND 1 - PREFLIGHT CHECK

### 1. Check the hardware

- Visually inspect the interior of the Sturnus for any loose screws or cables



- Confirm the correct propeller location. Red and Blue markings on the propellers should match markings on the drone



## 2. Install the drone on the Pelican case test stand

- The Velcro straps should be snug around the drone.



### 3. Install the LiPo battery onto the drone

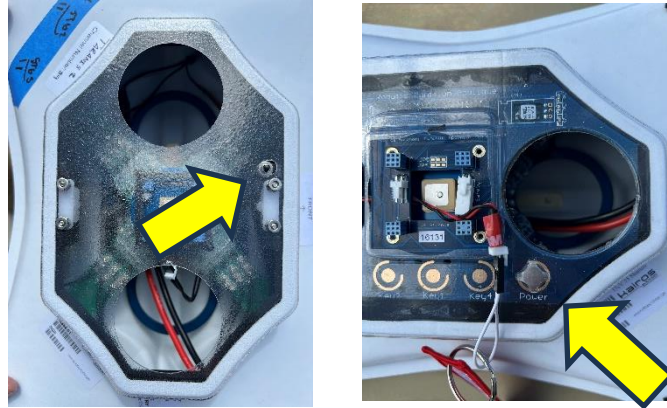
- Check the LiPo battery level. The battery level should be above 85%.



- Install and connect the LiPo battery onto the drone.
- Tuck the battery cables into the cavity in the drone after connecting the battery.



- Press the power button on the top of the drone for 5 seconds to turn it on
- Press the power button again for 5 seconds to turn the drone off



**Power Button on two generations of Sturnus drone**

#### **4. Power on the controller**

- Ensure all switches are in the disarmed state (**switches are away from you**) and the left thumb stick is pulled all the way down
- Press and hold the center power button for 4 seconds until the controller vibrates

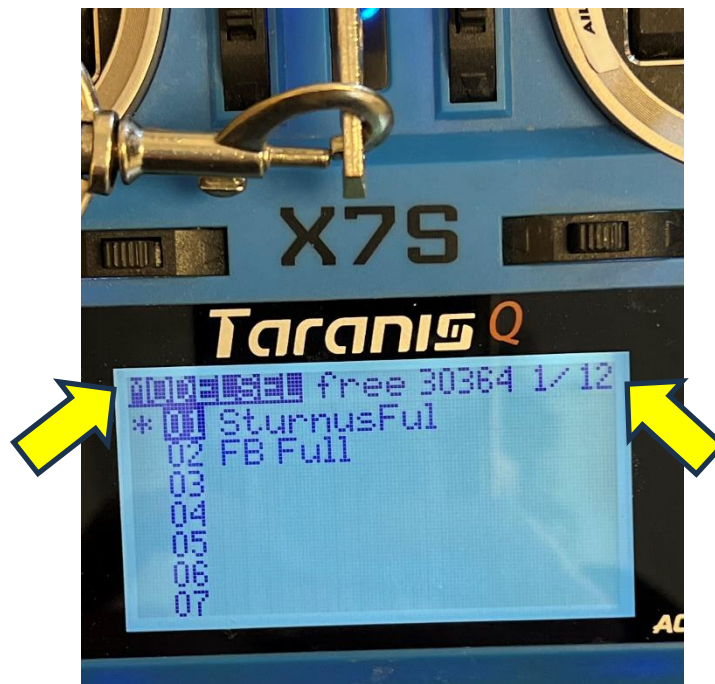


## 5. Change the settings on the controller

- Briefly press the **Menu** button (containing three horizontal lines instead of the word "Menu")



- The **MODELSEL** menu appears on the controller display, and the menu page number "1/12" displays in the top right of the screen



- Press the **Page** button once



- The **SETUP** menu appears and the top right of the screen displays "2/12"



- Spin the **Scroll dial** to scroll down through page 2/12



- Find a row labeled “RxNum.”
- Press the **Scroll dial** to select the “RxNum” menu and rotate the dial to move the selection reticle (black blinking rectangle) to “[BND]”



- Press the **Scroll dial** (center) once to select the **BND** setting

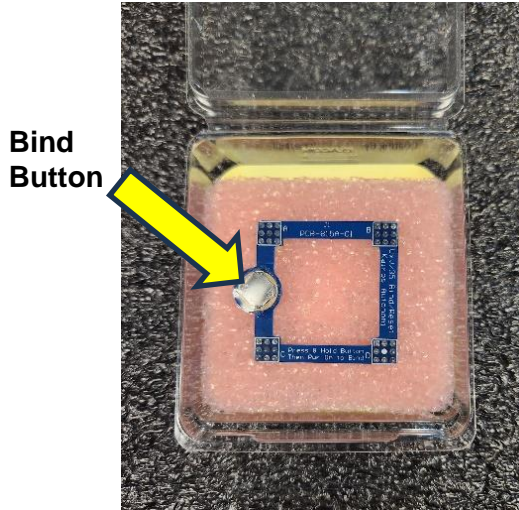


- Page **2/12** of the **SETUP** menu reappears and displays available channels
- Scroll with the dial to “Ch9-16 Telem On,” then press the center button to select that channel

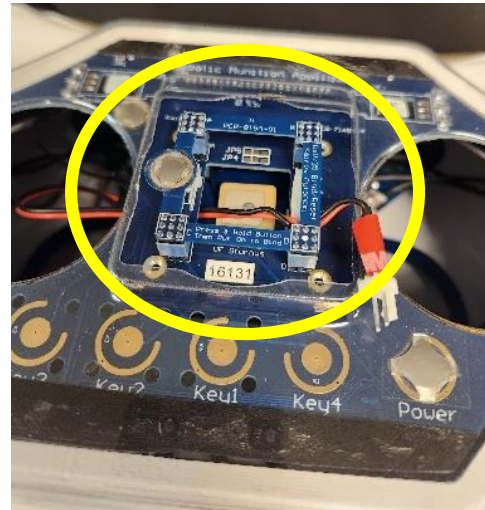


- The channel list disappears, and the controller begins to beep

**6. Install the Bind tool onto the top of the drone**

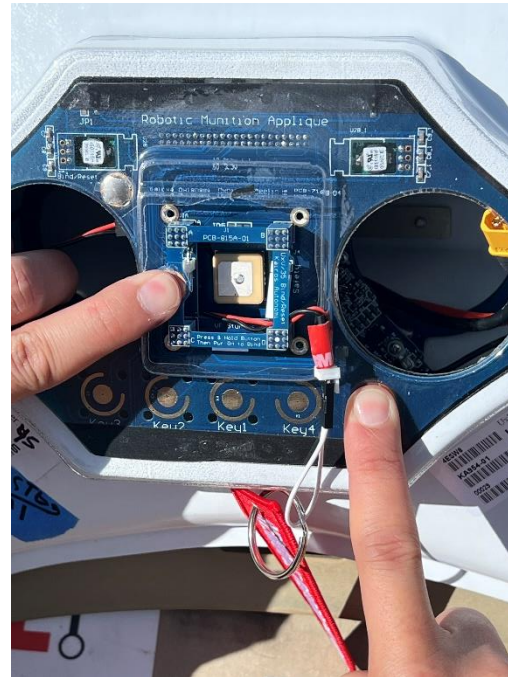
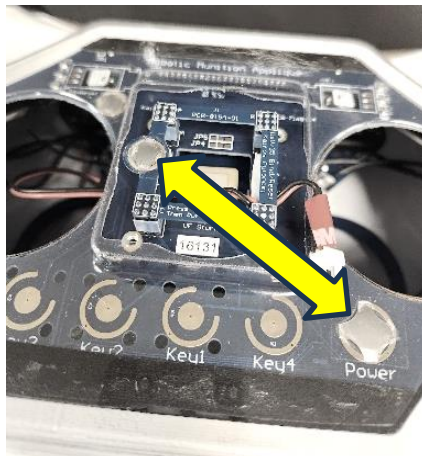


**Bind Tool**



**Bind Tool mounted on top of drone**

- Press and hold down the **Bind Tool** button and the drone's **Power** button at the same time for at least 10 seconds

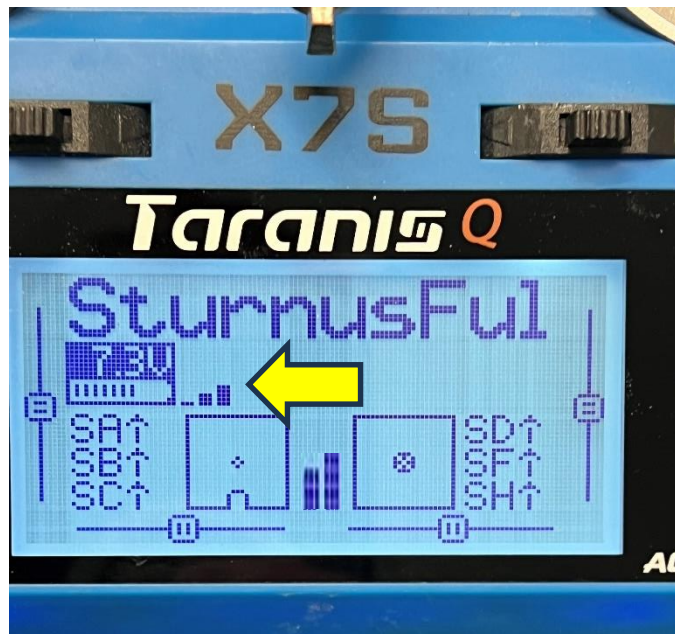




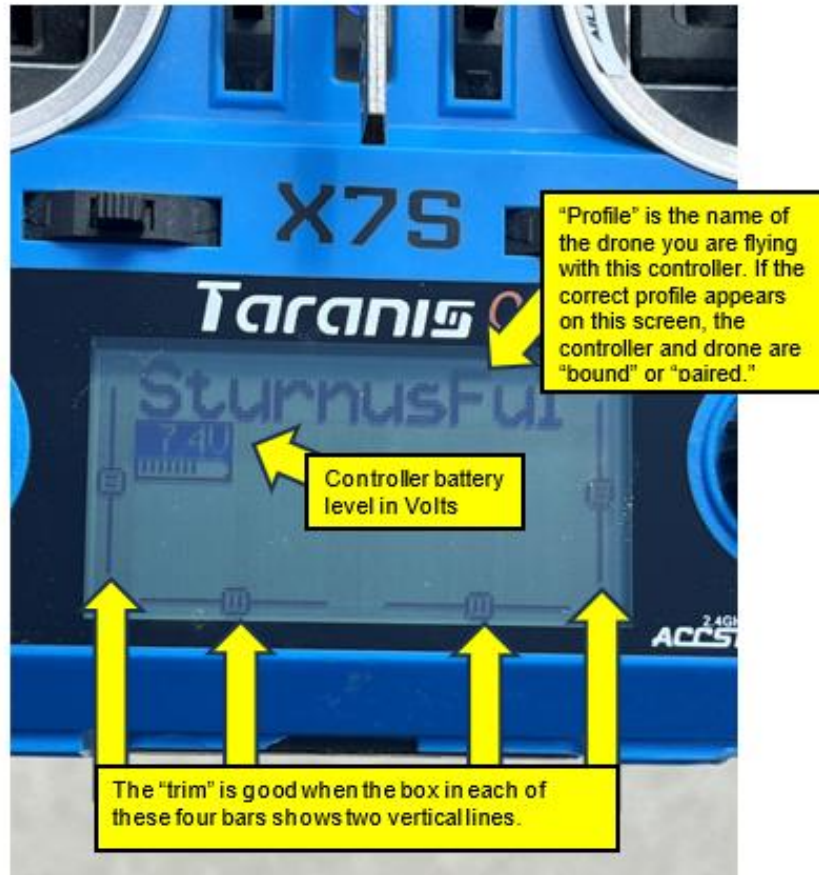
- After the drone is powered on for **10 seconds**, release the **Bind tool button** and the drone's **Power button**
- Press the **Exit button** on the controller three times to return to the controller's menu



- Signal bars confirm that the controller sees the drone



- Check the trims and profile
- Check the controller battery is above 6 bars



- Power off the drone by pressing and holding the power button on the lid for 5 seconds. When the drone is powered off, all lights on the drone will go off and the signal bars on the controller will go away

## TEST STAND 1 – TETHERED FLIGHT TEST

### 1. Perform a pre-flight check

- Put on safety goggles and review steps in Preflight Check Modules 1-3. Then perform the following steps:
  - Confirm Pelican carrying case latches are closed
  - Check if the controller is in disarmed mode



- Check if drone is properly secured to test stand with Velcro wrapped around each arm
- Power on the controller
- Power on the Warden and press the small button to send the **Run** command

- The bottom line on the Warden display should change to CMD: RUN



## 2. Arm the drone

- Put on safety goggles
- Power on the drone
- Confirm the controller is connected to the drone
- Remove the loopback with the “**Remove Before Flight**” tag

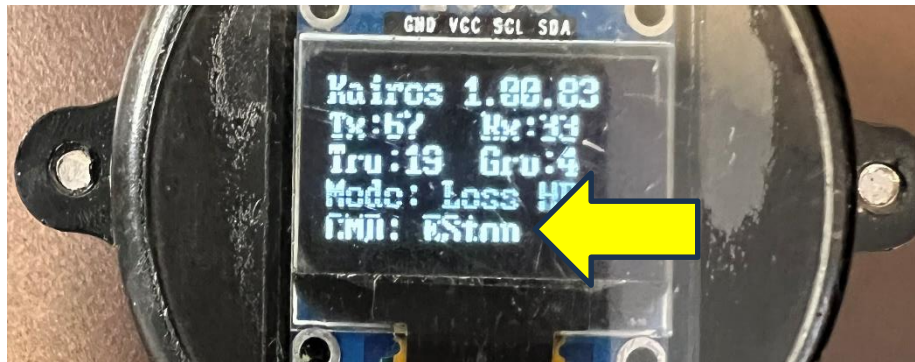


- Stand out of range of the drone's propellers and facing the same direction it will fly
- Arm the drone from the controller

### 3. Test the drone’s flight controls and E-Stop on the Test Stand

- Slowly raise the left throttle stick to 75%. The drone should level out on the test stand
- Move the left stick left and right to confirm Yaw movement. The drone should slightly change heading left or right
- Move the right stick forward and backwards to confirm Pitch movement. The drone should pitch forward and backwards
- Move the right stick left and right to confirm Roll movement. While the test stand will limit movement, there should be an audible change in pitch as the propellers change in speed
- Lower left throttle stick to 0
- Disarm the drone
  - Rearm the drone and throttle the left stick up to about mid-way, the drone should now be leveled and running on the test case
  - Press and hold the big button on the warden until the E-stop command is seen

The bottom line on the Warden display should change to **CMD: ESTOP**

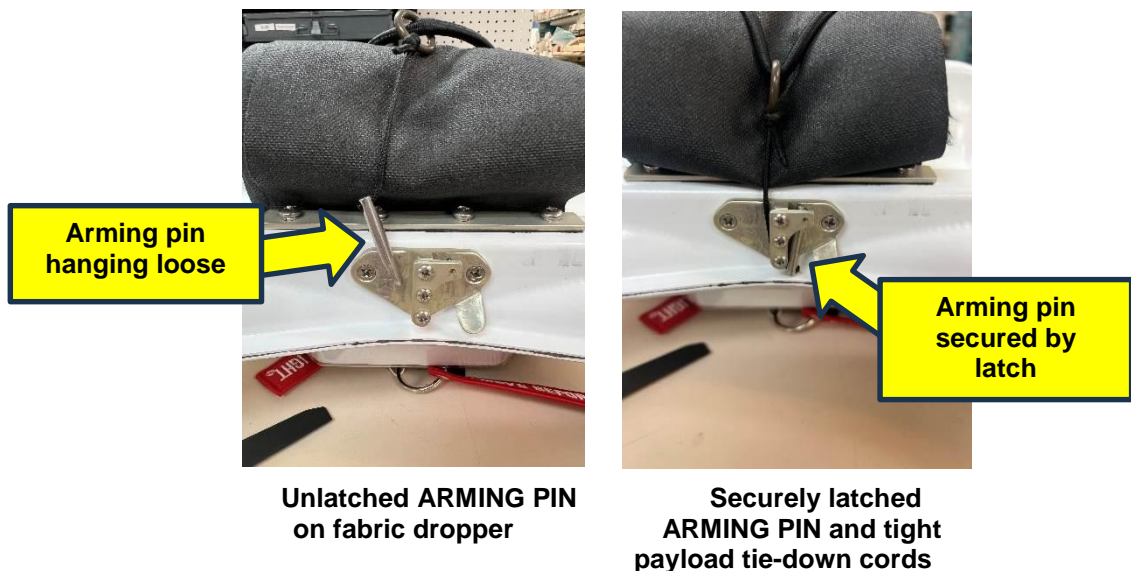


- Confirm the drone turns off and nothing is active
- Reinstall the loopback with the “**Remove Before Flight**” tag
- Put the controller in disarm mode and power on the drone
- Verify that the drone powers back on and functions normally

## TEST STAND 2 – UNTETHERED FLIGHT AND E-STOP CHECK

### 1. Stage the DISARMED drone on a padded surface

- Place the drone on a padded surface such as an exercise mat in an open area. Orient the front of the drone facing away from you
- Install a fully charged battery into the drone. Make sure battery cables are tucked inside the body of the drone
- Inspect the body of the drone making sure all connections and wires are securely fastened and the dropper is securely loaded



- Verify the controller is in the disarmed position with all switches facing away from you. Confirm the left throttle stick is at 0

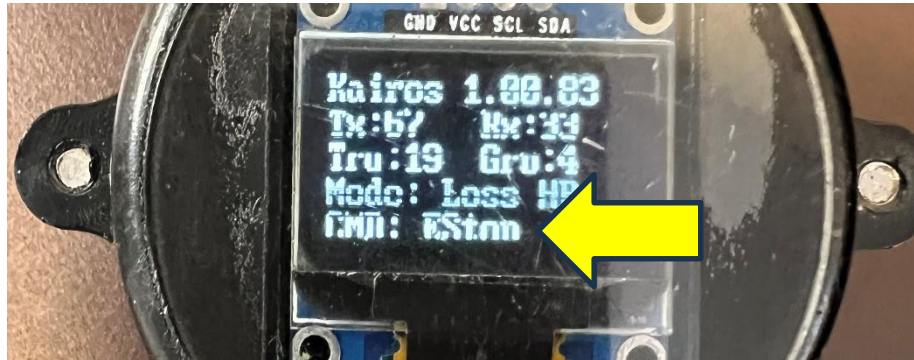


## 2. Test drone flight commands

- Power on the Warden and press the small button to send the Run command
- Straighten props and power on the drone, giving time for the drone to initialize (Up to 30 seconds)
- Power on the controller and verify that the drone and controller are paired
- Remove the loopback with the “**Remove Before Flight**” tag
- Arm the drone and fly the drone over the given padded area and gently lower the drone back to the ground

## 3. Test ESTOP

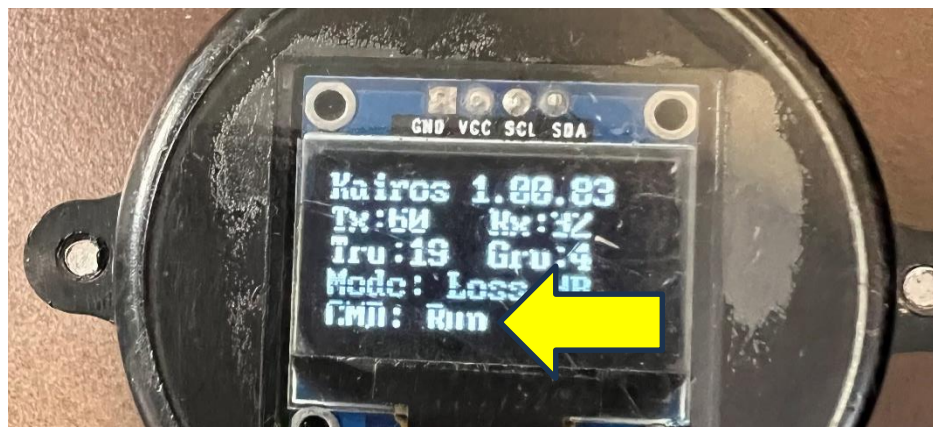
- Fly back into the air and hover over the padded area at around 2 feet
- Push and hold the big button on the warden to issue the E-stop command
- The bottom line on the Warden display should change to **CMD: ESTOP**



- Verify the drone turns off and drops onto the Padded area

## 4. Test Drone restart

- Disarm the drone on the controller
- Press the small button on the Warden to send the **Run** command
- The bottom line on the Warden display should change to **CMD: RUN**





- Reinstall the loopback with the “**Remove Before Flight**” tag
- Press and hold the **Power button** for 5 seconds on the drone to confirm it powers back on. Lights on the drone will turn on and there will be audible beeps

## TEST STAND 3 – DROPPER FUNCTIONALITY TEST

### 1. Load the dropper with tennis balls

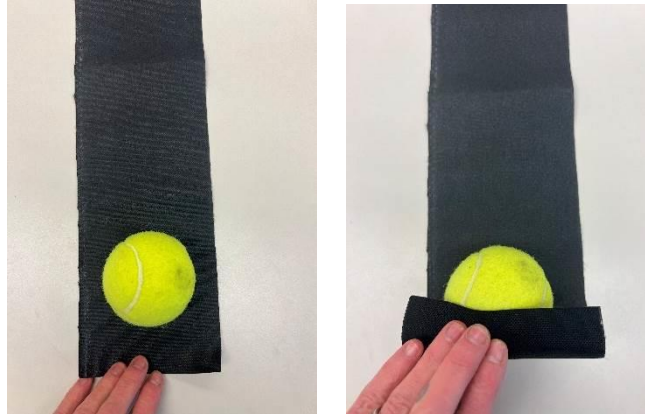
- Place the drone upside down on the Pelican test flight case



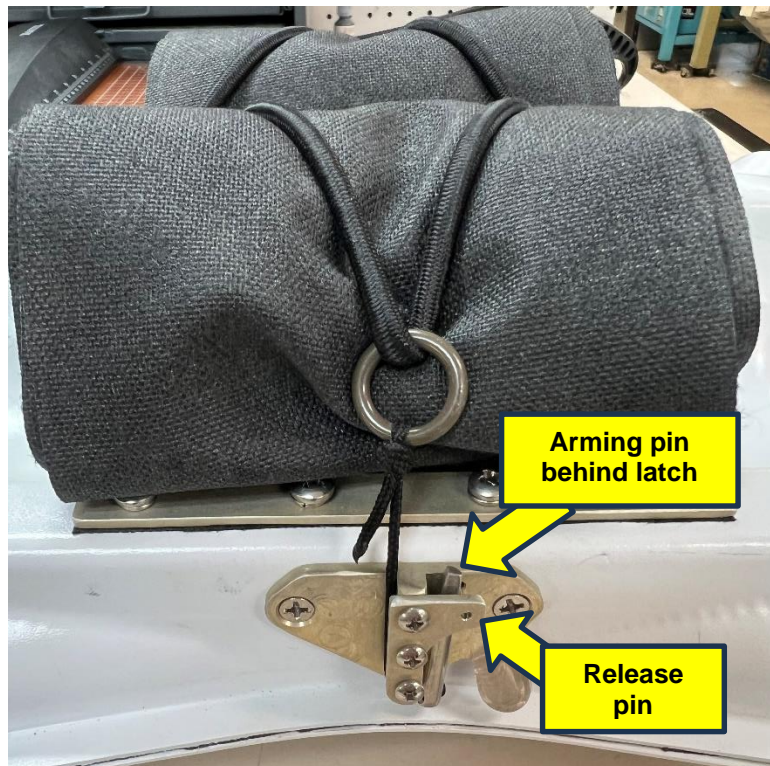
- Check for proper placement (motors are in the corner grooves and props are not being stressed)
- Unlatch the dropper's ARMING PIN and roll the fabric completely out



- Place the payload on the inside of the fabric and proceed to roll inwards towards the center of the drone. Keep the roll tight and with minimal overlap on the sides



- Rearm the **ARMING PIN** making sure that the **ARMING PIN** rope is over the middle section of the release fixture, and the **ARMING PIN** is held by the **RELEASE PIN**
- Repeat on other side of the drone



**When the payload is fired, this RELEASE PIN will retract inside the drone and allow the ARMING PIN to swing away, releasing the payload**

## 2. Release the dropper payload using the test stand

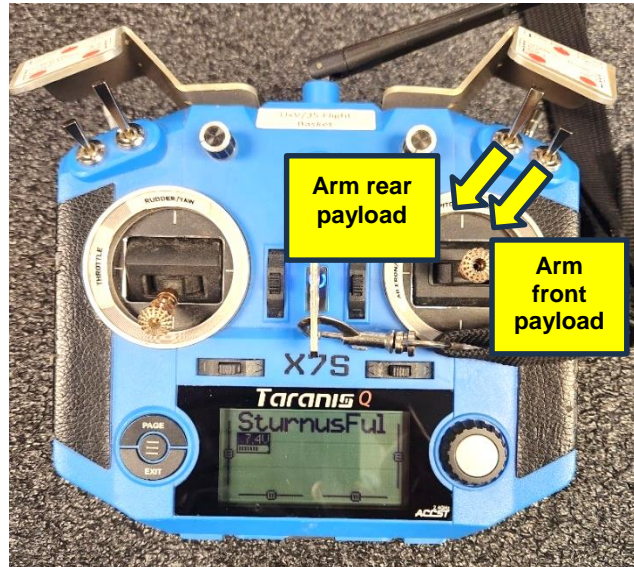
- Place the drone right-side up on the dropper test stand. Velcro at least two opposite diagonal sides



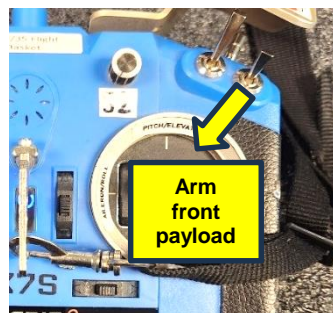
- Power on the drone and wait for it to initialize. Wear protective goggles
- Take the associated controller and check that all switches are away from you. The controller should be in the disarmed state and the payload switches should be away from you



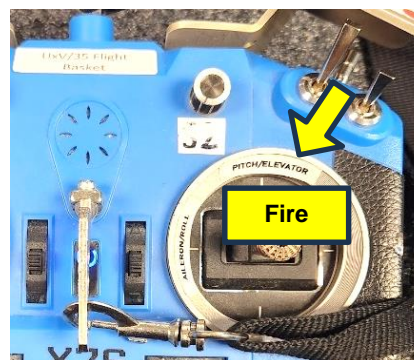
- Power on the controller. There are two payload switches. The left one of the two switches will arm the rear payload on the drone, while the right one will arm the front payload



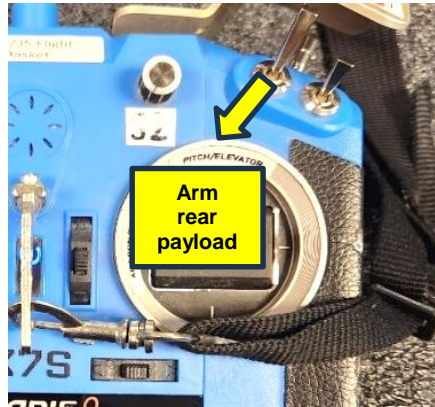
- Flip the **front PAYLOAD** switch toward you



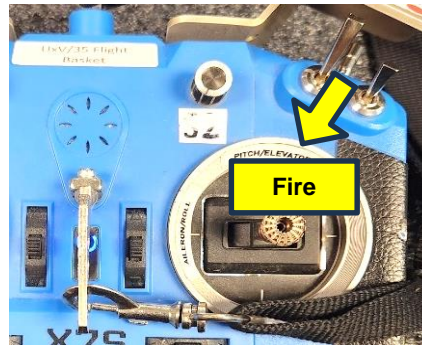
- On the controller, flip the **FIRE** switch on the back side of the controller toward you
- Verify the front payload has dropped



- Flip the rear **PAYLOAD** switch toward you



- On the controller, flip the **FIRE** switch on the back side of the controller toward you



- The payload releases and you see the hanging fabric tails indicating a successful drop



- Return all switches in the payload group to away from you
- Power off the drone and remove the battery
- Reload both payloads on the pelican flight test case

### 3. Release a payload from an untethered flight

- Reload the droppers
- Set the drone on a padded surface such as a foam mat
- Put on safety goggles
- Confirm that the loopback with the “Remove Before Flight” tag is installed



- Power on the Warden and press the small button to send the **Run** command
- Install a verified fully charged battery
- Power on the drone and wait for it to initialize
- Check that all switches on the associated controller are away from you, and power on the controller



- Remove the loopback with the “**Remove Before Flight**” tag
- Hover the drone over the padded area about 5 feet and arm both front and rear **PAYLOAD** switches
- Flip the **FIRE** switch. Both payloads should release which can be confirmed visually with two hanging fabric tails
- Land the drone and return all switches in the payload group away from you
- Reinstall the loopback with the “**Remove Before Flight**” tag



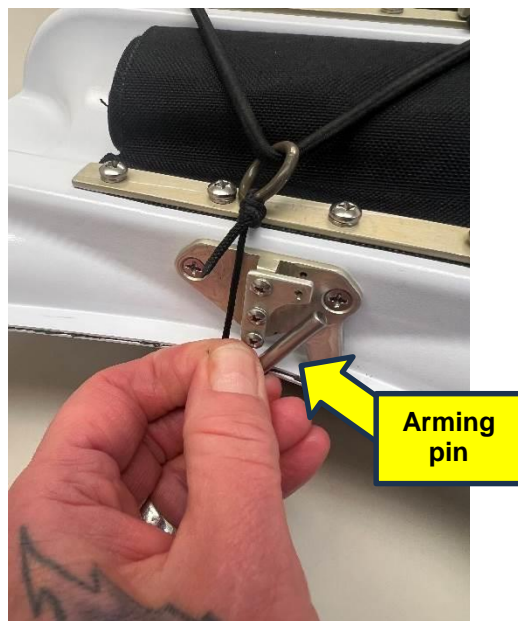
## TEST STAND 4 – LOAD BLUE BODY GRENADE

### 1. Position the drone for adding the payload

- Place the drone upside down on the Pelican test flight case



- Check for proper placement (motors are in the corner grooves and props are not being stressed)
- Unlatch the dropper's **ARMING PIN** and roll the fabric completely out



## 2. Load the grenade

- Place the grenade on the inside of the fabric.
- Offset the grenade to one side with the minimal amount of clearance needed to pull the safety pin



- LEAVE THE GRENADE SAFETY PIN INSTALLED** and proceed to roll inward toward the center of the drone. Keep the roll tight and with minimal overlap on the sides
- When fully rolled, the grenade will need to be in an orientation that **allows the safety pin to be removed**. If the safety pin ring is pointed in toward the center of the drone, unwrap the fabric and reroll after the grenade has been rotated 90 to 180 degrees



- Rearm the **ARMING PIN** making sure that the **ARMING PIN** rope is over the middle section of the release fixture and the **ARMING PIN** is held by the **RELEASE PIN**
- When the payload is fired, this **RELEASE PIN** will retract and allow the **ARMING PIN** to swing away, releasing the payload
- Adjust the elastic cords so that one sits on either side of the grenade body
- Repeat for the second payload, if required

### 3. Preflight Procedure

- Move the drone to the launching zone
- Confirm that the loopback with the “**Remove Before Flight**” tag is installed
- Power on the Warden and press the small button to send the **Run** command
- Confirm that all controller switches are in the disarmed state (away from you) and power on the controller
- Install a verified fully charged battery and power on the drone
- Wait for the drone to initialize and wear safety goggles
- Remove the loopback with the “**Remove Before Flight**” tag
- Flip the drone over
- Pull the safety pin on the grenade(s) while securely holding the fabric roll to prevent it from shifting**
- Flip the drone so it is facing up again
- The drone is now ready to proceed with the mission. Once over the desired target, follow the same procedure to drop the payload

### Version History

Date and Signature	Revisions	Reasons for Revision
3/28/2024 Jack Ronnie	Document was written. (v01.00.00)	
3/30/24 Jean Takach, Joyce Champion	Incorporate Ben's suggestions: procedures, add more photos.	



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