Pterosoar Operating Manual

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Section 1

General

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1.1 Introduction

This Section provides basic data and information of general interest. It also contains definitions or explanations of symbols, abbreviations, and terminology commonly used.

1.2 Warnings, Cautions and Notes

The following definitions apply to warnings, cautions, and notes used in this RPAS operating manual:

Warning: An operating procedure, practice, or condition, etc., that may result in injury or death if not carefully observed or followed.

Caution: An operating procedure, practice, or condition, etc., that may result in damage to equipment if not carefully observed or followed.

Note: An operating procedure, practice, or condition, etc., that must be emphasized.

1.3 List of Definitions and Abbreviations

1.3.1 Abbreviations and Acronyms

C2: Command and Control
DOP: Dilution of Precision
EMI: Electromagnetic interference

ESC: Electronic Speed Controller
GNSS: Global Navigation Satellite System
GPS: Global Positioning System
GSE: Ground Support Equipment
HITL: Human in the loop
HOTL: Human on the loop
IMU: Inertial Measurement Unit
LiPo: Lithium Polymer
PBM: Power Brick Mini
PDB: Power Distribution Board
QGC: QGroundControl
RPA: Remotely Piloted Aircraft
RPAS: Remotely Piloted Aircraft System
RSSI: Received signal strength indication
RTK: Real-time kinematics
VFR: Visual Flight Rules
VLOS: Visual Line of Sight

1.3.2 Definitions

As may be applicable, add here as needed.

Section 2

Description

Ref: 901.78 A manufacturer that has made a declaration to the Minister in respect of a model of remotely piloted aircraft system under section 901.76 shall make available to each owner of that model of system

(c) a remotely piloted aircraft system operating manual that includes

(i) a description of the system

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2.1 Introduction

This Section provides a detailed description of the RPAS and its Systems. Some equipment or payload described may be optional and as such not installed in the RPA. Refer to Section 7 for details of other optional equipment or payload.

2.2 Physical Description of the RPA

Airframe Type: Hexacopter

A primarily carbon-fiber construction RPA used for radio science work (mainly antenna calibration) at McGill University.

Built by: Larry Herman, McGill University, Montreal, QC, Canada.

2.2.1 Three-View of the RPA

2.2.2 Airframe

Pterosoar incorporates a Tarot Iron Man 680 carbon-fiber frame.

2.2.3 Dimensions

Overall Dimensions: 1015mm x 1015mm x 330mm

Important Dimensions:

Motor-to-motor diameter: 685mm

Height from ground to lower rods: 180mm

Height from ground to top of frame: 220mm

Propeller diameter: 13in

2.3 Flight Controls

Pterosoar uses a FrSky Taranis X9D Plus 2019 handheld controller for manual control. For automated control, a groundstation consisting of a laptop running QGroundControl communicates with the RPA via a telemetry system. The method of flight control is conventional: the Pixhawk Cube Orange flight controller varies each motor’s speed to produce the total required torque and thrust to achieve the desired attitude, altitude, and velocity.

2.4 Propulsion System

2.4.1 Motor | Propeller | Electronic Speed Control

Motors

Number of Motors: 6

Motor Manufacturer: DJI

Motor Model Number: 3510H

Motor Type: Brushless

Motor Power Rating: 420 KV

Propellers

Number of Propellers: 6

Propeller Manufacturer: DJI

Propeller Model Number: 1345S

Number of Blades: 2

Propeller Type: Fixed pitch

Electronic Speed Controls

Number of ESCs: 6

ESC Manufacturer: DJI

ESC Model Number: Inspire 1

ESC Type: PWM

ESC Power Rating: 26V, 20A

2.4.2 Battery

Battery Manufacturer: Tattu

Battery Type: 6S LiPo

Number of batteries required for flight: 1

Number of spare batteries required (available) on site: Mission-dependent

See Section 3.7 for battery limitations.

2.5 Electrical System

The Pterosoar 6S LiPo battery has a maximum voltage of 3.3V – 4.2V per cell. The battery connects directly to a Power Brick Mini (PBM) power supply via AS150 and XT60 connectors. The PBM supplies full battery voltage to the Power Distribution Board (PDB), and stepped-down 5V power to the Pixhawk Cube Orange flight controller. The PDB supplies electrical power to the motors and ESCs. The flight controller supplies electrical power to all other components.

2.6 Avionics System

The primary component of the Pterosoar avionics system is the Pixhawk Cube Orange flight controller. Internal Pixhawk sensors include 3 accelerometers, 3 gyroscopes, 1 compass, and 2 barometric pressure sensors. All other flight-related sensors and radios connect directly to the Pixhawk.

Key features of the Pixhawk:

32bit STM32H743ZI (32bit ARM Cortex M7, 400 MHz, Flash 2MB, RAM 1MB)

32bit STM32F103 failsafe co-processor

14 PWM / Servo outputs (8 with failsafe and manual override, 6 auxiliary, high-power compatible)

Abundant connectivity options for additional peripherals (UART, I2C, CAN)

Redundant power supply inputs and automatic failover

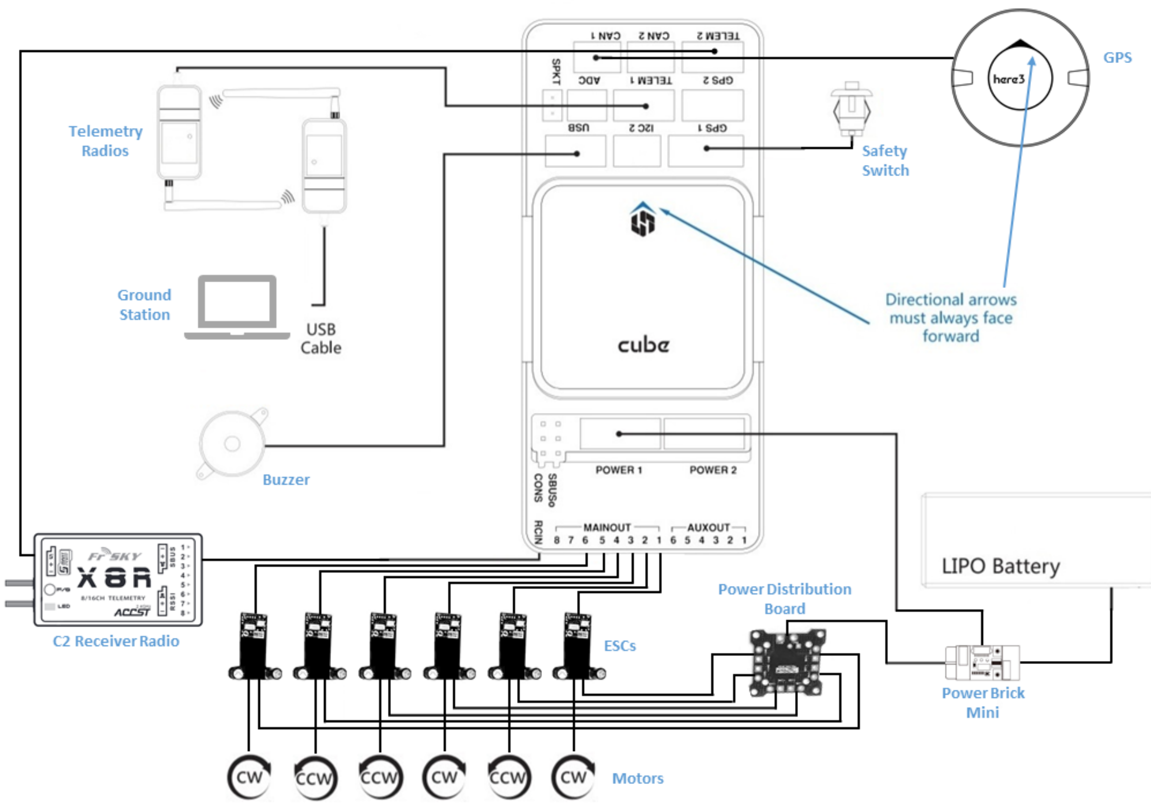
External safety switch

Multicolor LED main visual indicator

High-power, multi-tone piezo audio indicator

microSD card for high-rate logging over extended periods of time

Below is a diagram of the Pixhawk Cube Orange with all other flight-related components connected. These components are discussed in more detail elsewhere in this Section.



All sensors and antennas are mounted directly on the central platform, with the exception that one blade antenna from the X8R radio is mounted on arm #1.

2.6.1 Navigation

The Pixhawk Cube Orange flight controller also functions as the autopilot. It is a digital, solid-state system that accepts pre-programmed flight plans uploaded from QGroundControl. It controls the RPA via the conventional flight control system, varying motor speeds to produce the desired torque and thrust to control attitude, altitude, and velocity.

The Pixhawk employs an Estimation and Control Library (ECL) which utilizes an Extended Kalman Filter (EKF) algorithm to process sensor inputs and compute the position state of the RPA. Sensors incorporated into the EKF state estimation include the GPS, IMU, magnetometer, and internal barometric pressure sensor.

Pterosoar’s navigation system includes two separate GPS systems.

The primary GPS system is the Here3 GPS. In the default mode, with a 3D lock the Here3 has an accuracy of +/- 2.5m in any direction. When using the base station for RTK performance, the accuracy is +/- 0.025m in any direction.

The secondary GPS is the Radiolink M8N GPS SE100. The M8N has an accuracy of 0.5m.

2.6.2 Telemetry

Pterosoar uses Holybro SiK Telemetry V3 radios. Telemetry is streamed to the laptop base station running QGroundControl.

Specifications:

Output power: 100mW

Operating frequency: 915MHz

Firmware: Open-source SIK

2.6.3 Command and Control Link

Control via the laptop base station running QGroundControl, as well as wireless flightplan upload for autonomous operation, is conducted via the 915MHz telemetry radios.

Manual control is conducted via the FrSky Taranis X9D Plus SE 2019 handheld controller. Specifications:

Output power: 32mW

Operating Frequency: 2.4GHz

Firmware: Open-source OpenTX

The Taranis X9D and the RPA communicate via a FrSky X8R radio. Specifications:

Output power: 39mW

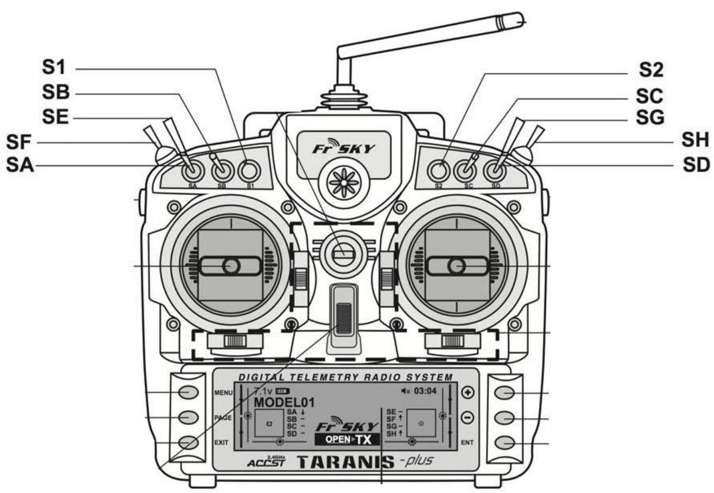
Operating Frequency: 2.4GHz

Firmware: FrSky ACCST D16

2.7 Remote Pilot Station

The groundstation uses QGroundControl on a laptop with standard keyboard and trackpad. The health and status of the RPA is displayed at the top of the main screen. Navigation information, including a real-time depiction of the RPA on a map, and flight plan information is the main element of the home screen of QGC, as shown below.

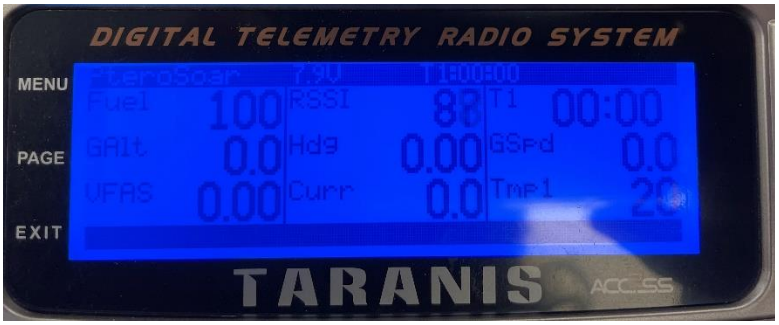
The Taranis X9D controller has the following switch layout:



The controller is configured such that the left stick controls thrust and yaw, and the right stick controls lateral motion (Mode 2).

The primary flight mode switch is SA, and it's 3 positions are assigned to Altitude (Alt Hold) (up), Position (Pos Hold) (middle), and Mission (Auto) (down). When SC is up, it overrides to Manual mode (this may only be for testing). Moving SE to middle/down will override to Return (RTL). Moving SF to down will override to Land. SC middle/down, SE up, and SF up are all inactive positions.

The main telemetry screen of the Taranis X9D has been configured to show the following information:



2.8 Firmware | Software

QGroundControl: Version 4.1.3

FrSky Taranis X9D: OpenTX version 2.3.12

Pixhawk: PX4 version 1.12.3

Holybro SiK telemetry radio: SiK version 2.1

FrSky X8R radio: ACCST D16 version 2.1.0

Here3 GPS: version 1.6

2.9 Ground Support | Surveillance

No specific GSE is required for the Pterosoar. The RPA must be flown within visual LOS.

Section 3

Operating limitations

Ref: 901.78 A manufacturer that has made a declaration to the Minister in respect of a model of remotely piloted aircraft system under section 901.76 shall make available to each owner of that model of system

> **(c)** a remotely piloted aircraft system operating manual that includes
>
> > **(ii)** the ranges of weights and centers of gravity within which the system may be safely operated under normal and emergency conditions and, if a weight and center of gravity combination is considered safe only within certain loading limits, those limits and the corresponding weight and center of gravity combinations,
> >
> > **(iii)** with respect to each flight phase and mode of operation, the minimum and maximum altitudes and velocities within which the aircraft can be operated safely under normal and emergency conditions,
> >
> > **(iv)** a description of the effects of foreseeable weather conditions or other environmental conditions on the performance of both the system and the pilot

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3.1 Introduction

This Section includes operating limitations which are necessary for the safe operation of the RPAS, its motors, standard equipment and standard payload. All information and limits in this Section apply to both normal and emergency conditions.

Warning: All limitations given in this Section must be complied with for all operations.

Note: Refer to the Supplements, Section 7 of this operating manual for information regarding specific equipment or payload.

3.2 Weight | Center of Gravity Limits

To obtain the performance, flight characteristics, and safe operation described in this RPAS operating manual, the RPA must be operated within the permissible weight and center of gravity limitations specified in this Section.

3.2.1 Weighing Procedures

For weighing, the RPA should be placed in the normal ground position in the center of the scale.

3.2.2 Weights

Basic Weight (including battery): 3.82 kg

Maximum Take Off Weight: 6.30 kg

Maximum payload: 2.48 kg

Warning: Exceeding weight limitations may lead to overloading of the RPA structure and cause loss of control of the RPA and/or structural damage.

3.2.3 Center of Gravity

Pterosoar is a hexacopter with very long moment arms relative to the width of the central platform. The moment arm of any motor to the geometric center of the RPA is 342.5mm, compared to the width of the central platform of 175mm. As a result, components of typical drone equipment weights essentially cannot result in a limiting-case balance condition.

The heaviest component is the battery which is mounted on-centerline at the geometric center of the RPA and as such cannot produce an unbalanced condition. The next heaviest component is the Pixhawk Cube Orange which weighs 73g. Any component weighing less than 73g is considered safe to mount to the central platform without encroaching any limiting-case balance condition.

Any payload must be mounted on-centerline of the central platform. Payloads must be attached to the drone in such a manner that they cannot move or swing dynamically (i.e., no pendulum-style payloads that can swing freely). The flight controller has not been tested with such dynamically movable payloads.

Warning: Exceeding the center of gravity limitations reduces the maneuverability and stability of the RPA.

3.3 Altitude Limitations

Maximum altitude: 400 ft AGL or 100 ft above a structure when within 200 ft horizontally from the structure.

Maximum base station altitude: 10,000 ft MSL.

Note: During extended operations, the local barometric pressure (i.e. the local altimeter setting) can change significantly. During such operations, update the QNH barometric altimeter parameter or cycle flight controller power prior to each flight.

3.4 Velocity Limitations

Maximum horizontal speed: 20 m/s

Maximum takeoff vertical speed: 5 m/s

Maximum landing vertical speed: 1 m/s

Note: The above limits are based on maximum allowable parameters in QGC and demonstrated performance.

Caution: Maneuver speed and Vne have not been measured. Avoid abrupt control inputs.

3.5 Weather Limitations and Effects on System and Pilot

Wind

Wind limitations: 10 kts sustained, 15 kts gusting.

It is expected that operators have a clear understanding of the effect of wind on aviation, and that flying in wind will have operational effects. In automated (HOTL) flight modes including pre-programmed flight path, automated takeoff, automated landing, or RTH, the RPA will fly against the wind to maintain it's desired position or flight path. The same is true of semi-automated (HITL) modes including position or altitude hold. In manual mode, the operator must be aware of the winds and make the appropriate inputs to counteract them. In all cases, the effects of flight against the wind on battery endurance should be considered.

Caution: In manual flight mode, flight against winds aloft may increase pilot fatigue.

Temperature

Ambient temperature operating range: 0°C to 40°C

Caution: Consideration should be given to the effects of ambient temperature on pilot fatigue.

Air density

Air density is an important factor in rotary-wing aircraft operations as it directly impacts the generation of lift. Consideration should be given to the density altitude at the time of flight. If the density altitude for the given conditions is abnormally high and aircraft performance seems affected (excess thrust required for takeoff or to maintain altitude), consider aborting the flight.

Caution: Also consider the effects of abnormally high density altitudes on pilot fatigue.

Precipitation

Flight in any form of precipitation is prohibited.

Vibration

Vibrations generally result from the operation of the RPA itself. The Pixhawk flight controller includes vibration isolation on two of the IMU's, with a third fixed IMU as a reference / backup.

Icing

Flight is prohibited when icing conditions are observed, are reported to exist or are likely to be encountered along the route of flight. Flight is prohibited with frost, ice or snow adhering to any part of the RPA.

Electromagnetic Environment

Consider the effects of electromagnetic interference (EMI) from nearby sources such as cell towers, microwave radio relays, or Wi-Fi transmitters. If any interference with the telemetry or C2 link is suspected, abort the flight until the interference is eliminated.

It is strongly suggested to know the KP index expected on the day of the flight. This is the index used to express the magnitude of geomagnetic storms. The scale of the KP index ranges from 0 to 9. It is strongly discouraged to fly a drone when the KP index is between 4 and 9 as this indicates a geomagnetic storm. A geomagnetic storm interferes with the drone's GPS positioning.

3.6 Kinds of Operation

RPAS flights are limited to Visual Line of Sight (VLOS) flights, under DAY Visual Flight Rules (VFR) conditions.

Night flight is prohibited.

3.6.1 Operations in Controlled Airspace

Operations in controlled airspace require an advanced drone pilot certificate and filing with Nav Canada.

Required Accuracy

> (1) The remotely piloted aircraft system must have a lateral position accuracy of at least +/- 10m while operating within the controlled airspace.
>
> (2) The remotely piloted aircraft system must have an altitude accuracy of at least +/- 16m while operating within the controlled airspace.

Pterosoar has demonstrated that it meets these accuracy requirements. Results of GPS/altitude verification testing are on file.

The following GPS error considerations should be taken into account during flight operations:

Errors. Accuracy is a probabilistic measurement based on assumptions related to the quality and integrity in a constantly changing environment. It is important to understand the errors that may contribute to degradation of accuracy and take these into account as part of the overall design error budget. Examples of sources of errors adversely affecting accuracy are identified below.

Terrain Errors. GNSS signals are also subject to errors caused by the terrain. Terrain masking of the signal, for example by a building or mountain, blocks the antenna on the RPAS from receiving the satellite signal. A GNSS signal reflected by the landscape such that the receiver now receives "additional" signals which can create confusion and may need to be processed out to avoid creating position errors.

Atmospheric Errors. Atmospheric errors are caused by the Ionosphere and the Troposphere, which are both capable of refracting GNSS radio signals. Ionospheric Density is diurnally dependent, which means that it varies with time of day (or night). The density is affected by, among other factors, humidity, temperature and pressure. These variations adversely affects the "signal speed x time" equation built into GNSS position calculations. To correct for these errors, a number of steps are taken. Troposphere errors can be caused by moisture absorbing/refracting signal and cause errors up to 6m. Ionosphere errors can be caused by the atmospheric refraction of the GNSS signals and may be up to 40-60 m by day and 6-12 m at night. These errors can be mitigated by the use of multi-frequency receivers, selection of masking angle, and/or the use of augmentation systems (either ground-based, such as Local Area Augmentation System [LAAS], or space-based, such as European Geostationary Navigation Overlay Service [EGNOS]).

Satellite Errors. These are errors resulting from poor or unexpected geometries related to the positions of the GNSS satellites in reference to an RPAS. Gravitational effects of the Sun and Moon may pull the SV from planned orbital path. Solar Radiation creates EMI prior to the signal hitting the atmosphere.

Geometric Dilution of Precision (DOP). DOP occurs when there is no adequate cross cut in the "fix" (i.e. all satellites are all too closely located to each other). The consequence is that all of the signals are vulnerable to same errors from the atmosphere. Errors can occur in the horizontal (H), the vertical (V) and in time (T).

3.6.2 Modes

With the exception of automated takeoff, the following modes may be engaged via the Taranis X9D controller as described in section 2.7. All settings are configurable via QGC. Position hold is the recommended flight mode for hand-flying. All flight modes are designed for operation with all motors functioning.

Caution: If any motor ceases functioning, land immediately.

Fully-automated (HOTL):

Mission: Vehicle executes a predefined mission/flight plan that has been uploaded to the flight controller.

Return to Home: Ascend to safe altitude and return via a direct path to the home location.

Auto takeoff: Vehicle ascends to takeoff altitude and holds position. Triggered via QGC.

Auto land: Vehicle lands at the position where the mode was engaged.

Semi-automated (HITL):

Position Hold: RC mode where roll, pitch, throttle sticks control movement in corresponding axes/directions. Centered sticks level vehicle and hold it to fixed altitude and position against wind.

Altitude Hold: RC mode like Manual mode but with *altitude stabilization* (centered sticks level vehicle and hold it to fixed altitude). The horizontal position of the vehicle can move due to wind (or pre-existing momentum).

Non-automated:

Manual: RC mode where centered sticks level vehicle (only - position is not stabilized).

3.7 Battery Limitations

Use only 6S LiPo batteries with AS150 connectors. Consideration should be given to battery weight vs capacity if replacing the battery.

Battery capacity: 16000mAh

Maximum charge rate: 1C

Maximum discharge rate: 15C

Ambient temperature for battery charging: 0°C to 43°C.

Ambient temperature for battery discharging: 0°C to 60°C.

Warning: Battery exposure to temperatures greater than 60°C for extended periods of time (more than 30 minutes) may result in damage to the battery or a fire.

3.8 Range and Endurance Limitations

3.8.1 Battery

The battery will nominally last approximately 25 minutes depending on flight conditions.

3.8.2 Command and Control Link

The C2 link has a published range of 1.5km. Maintaining VLOS will likely require a reduced range.

Section 4

Hazards, Protections, and Warning systems

Ref: 901.78 A manufacturer that has made a declaration to the Minister in respect of a model of remotely piloted aircraft system under section 901.76 shall make available to each owner of that model of system

(c) a remotely piloted aircraft system operating manual that includes

- **(v)** the characteristics of the system that could result in severe injury to crew members during normal operations,
- **(vi)** the design features of the system, and their associated operations, that are intended to protect against injury to persons not involved in the operations,
- **(vii)** the warning information provided to the pilot in the event of a degradation in system performance that results in an unsafe system operation condition,

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4.1 Introduction

This section describes potential hazards to RPAS crewmembers, design features to protect against injury to persons not involved in RPAS operations, and the RPAS warning and alert systems.

4.2 Hazards to RPAS crew

Electric shock: The maximum battery voltage is 25.2V which poses a minimal shock risk. The PDB is purposefully located at the center of the frame platform and is difficult to reach by hand, so the chance of accidental contact is remote. The battery should be checked for damage or swelling prior to each use, and never short-circuited.

Laceration: Crew members should not approach the RPA on the ground when armed for flight, or at all when motors are spinning. There is a loud buzzer to alert personnel that the drone is armed for flight and should not be approached. The RPA cannot be armed unless the safety switch has been pressed and held for approximately 2 seconds. If there is a preflight delay, the safety switch should be deactivated to prevent inadvertent arming or motor actuation.

Trauma injuries: Crew members should not approach the flightpath of the RPA unless necessary for an emergency or safety concern, and should never stand directly beneath it. Unless required, it is good practice to stay at least 5m laterally from the RPA.

Burns: Crew members should not mishandle the battery. Mishandling the battery can pose a fire risk. Puncturing, short circuiting, or exposing the battery to excessive ambient temperature could cause a fire. Mishandling the battery during charging by selecting the wrong battery type, failing to perform a balanced charge, or excessive charge rate could cause a fire.

Note: See Section 3.7 for battery limitations.

4.3 Protections Against Injury to Uninvolved Personnel

Pterosoar is not intended to fly over or near people and must maintain 100 ft horizontal separation at any altitude from any non-crew member or person uninvolved in its operations.

The flight crew should include visual observers to ensure that uninvolved personal do not approach the flightpath or come within 100 ft of the RPA.

The RPA has configurable failsafe actions. Failsafe actions include: provide a warning, hover in place, return to home, or land in place. The following conditions can be specified to trigger a failsafe action:

Geofencing: Virtual regions within which the vehicle can fly, or in which it is *not allowed* to fly. The geofence regions are configurable in QGC. Breaching the fence triggers the failsafe action.

Low power: Battery level which triggers the failsafe action is configurable via QGC.

Lost link (C2 or Telemetry): Link loss timeout and failsafe action for either datalink are configurable via QGC.

4.4 Warnings and Alerts

The primary warning system is through QGroundControl. The laptop base station will sound an audio alert and give a corresponding on-screen message of any system degradation. Alerts include but are not limited to low signal strength, low battery, non-responsive motor, GPS degradation, Pixhawk sensor degradation or failure, geofence alert, etc.

Types of alerts include:

> Warning Alert: For conditions that require immediate pilot awareness and immediate response;
>
> Caution Alert: For conditions that require immediate pilot awareness and subsequent response; and
>
> Advisory Alert: For conditions that require pilot awareness and may require subsequent response.

Examples of marginal performance alerting includes:

> GPS errors including GPS dilution of precision (DOP) when the geometries of available satellites does not provide sufficient coverage to meet navigation precision.
>
> Navigation/Orientation errors such as Inertial Measurement Unit sensor faults/drifts.
>
> Degradations in C2 link bandwidth and responsiveness cause by unknown or uncharacterized sources of interference, indicated by reduced or marginal RSSI.

Most warnings also appear on the screen of the Taranis X9D with corresponding audio cueing.

Section 5

Normal and Emergency Operating Procedures

Ref: 901.78 A manufacturer that has made a declaration to the Minister in respect of a model of remotely piloted aircraft system under section 901.76 shall make available to each owner of that model of system

> **(c)** a remotely piloted aircraft system operating manual that includes
>
> > **(viii)** procedures for operating the system in normal and emergency conditions

See document “Normal and Emergency Procedures” as well as the pre-flight planning guide.

Section 6

Handling, Care and Maintenance

Ref: 901.78 A manufacturer that has made a declaration to the Minister in respect of a model of remotely piloted aircraft system under section 901.76 shall make available to each owner of that model of system

> **(a)** a maintenance program that includes
>
> > **(i)** instructions related to the servicing and maintenance of the system, and
> >
> > **(ii)** an inspection program to maintain system readiness;
>
> **(c)** a remotely piloted aircraft system operating manual that includes
>
> > **(ix)** assembly and adjustment instructions for the system.

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6.1 Introduction

This Section contains the recommended procedures for proper handling of the RPA. It also identifies certain inspection and maintenance requirements which should be followed if the RPA is to retain its original performance and dependability.

6.2 Transport | Storage

Pterosoar should be transported in its protective carrying case with sufficient padding. Propellers should be removed. It is recommended to tape off the positive terminal of the battery.

6.3 Assembly | Disassembly

The forward and rear motor arms are hinged and lock in the central position for storage, and in the deployed position for flight. The landing gear is hinged and locks in the downward position for flight operations. The propellers incorporate a DJI quick release mounting system and lock in place.

6.4 Cleaning and Care

The RPA can be cleaned with a soft cloth and isopropyl alcohol. Ensure the battery is disconnected and the RPA is powered off prior to cleaning.

6.4.1 Propeller Care

Propellers must be checked before each flight for nicks or cracks and installed securely.

6.4.2 Battery Care, Storage, and Use

The battery is charged using HT206 charger. Ensure LiPo battery type and balanced charge are selected. The maximum charge rate is 1C and discharge rate is 15C. Do not exceed 4.2V per cell. If the voltage is less than 3.3V in any cell, the battery must be replaced. For long term storage (over a week), the battery should be charged to 3.8V – 3.9V per cell.

6.5 Scheduled Maintenance

6.5.1 Annual Inspection

Test all batteries for capacity.

Upgrade firmware and software to latest revisions.

6.5.2 500 Hour Preventive Maintenance

Disassembly, inspection of components for wear, replace any components as required by manufacturer.

Test all motors and replace if necessary.

Test all batteries for capacity.

Upgrade firmware and software to latest revisions.

6.6 Other Field and/or Shop Maintenance

Either the Here3 GPS or the M8N SE100 GPS may be used. The Here3 plugs into either CANbus port of the Pixhawk. The M8N SE100 plugs into the GPS2 port and the I2C port of the Pixhawk.

Section 7

Supplements

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7.1 General

This Section contains information regarding optional equipment | payload | accessories which may be installed in the RPAS.

7.2 Radio Payload

Radio payload is still under development.