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SKYNEX GLOBAL DRONES, Ltd.

SKYNEX BLUE BOOK TO DRONE MAINTENANCE + FLIGHT PLANNING

Generally Accepted + Recommended Best Practices

All comments, suggestions for revisions, and additions to the within drone maintenance and flight planning manual are welcome at mail@skynexglobaldrones.com.

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Properly maintaining and preserving your drone will ensure safer flights, longer drone life, and optimized flight performance for better end-results.



OVERVIEW

- **Drone Maintenance: Importance + Relevance**

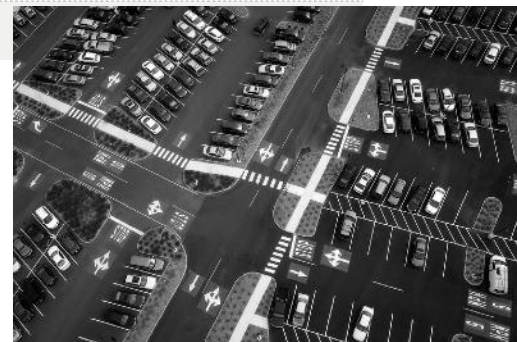
Properly maintaining your fleet of drones is important not only to ensure they will continue to fly for the many years ahead, but also as a matter of safety and protection to drone operators, staff, spectators, by-standers, property, and the general public. Within the context of commercial and industrial drone operations, whether it be for conducting industrial surveys, inspections, photography, or some other purpose, proper drone maintenance also means ensuring your drone delivers its full potential for optimum end-results.

- **What To Expect, and What To Find Herein**

The within work distills from the wealth of online information on drone maintenance one set of drone maintenance and flight planning best practices. For greater clarity, coherence, and ease of reference to the reader, we've structured drone maintenance into a six-step cycle: **(1)** Drone maintenance prior to a schedule drone operation; **(2)** Drone maintenance prior to take-off; **(3)** Take-off; **(4)** landing; **(5)** in-between flights; and **(6)** off-day maintenance. Critical to note while reading through these six steps is that each drone has its own unique features and characteristics, and therefore, its own unique maintenance needs. The information provided in this manual offers general tips and advice on drone maintenance. Under no circumstances should information contained in this manual replace any drone-specific maintenance information provided by the manufacturer. Drone-specific maintenance information provided by the manufacturer should take precedence over any information contained in this guide. In fact, drone owners and operators should become intimately acquainted with any information on maintenance provided by their drone manufacturer. It is also recommended that new drone owners become intimately familiar with their drones: understand how your drone functions; learn every part of your drone, how it attaches to it, what it does, and how it works. Lastly, regional factors can have an effect on how you maintain your drone. For instance, drone owners in Alaska will have different maintenance needs than a drone owner with the same drone living in Texas. Local, regional, and national regulatory authorities are a good source to obtain location-specific maintenance tips and advice. Drone owners and operators will want to ensure compliance with any laws, rules, and/or regulations affecting drone maintenance, flight, and safety.

✓ DAY-PRIOR TO FLIGHT

Comply with region-specific drone laws and regulations:
Permits, licenses, registrations, notices
Flight restrictions, limitations, requirements, etc. (e.g. max. altitude)
Install latest drone software, firmware, and App updates:
Check online forums for drone-specific reports on bugs
Drone dependent on peripheral devices (Tablet, Smartphone, etc.):
Install latest updates on peripheral device(s)
Ensure drone receiver properly bound to drone transmitter
Monitor local daily weather forecast
Wind strength and direction
Humidity percentage (%)
Cloud formation and density
Percentage (%) chance of precipitation
Smog, fog, or smoke
Extreme temperatures (battery life shortened in cold weather)
Drone range test (if necessary):
Drone-specific range capabilities may be available online
Pre-plan your drone flight trajectory intelligently (including w/ "Waypoint Flight" Mode)
Identify and anticipate possible drone flight hazards or obstacles:
Airports, military bases, sky-diving, and other restricted air spaces
Power lines, phone lines, buildings, mountains, trees, water fronts, etc.
Structures and objects likely to cause drone signal interference
Determine best and safest location for drone pilot stationing
Back against blinding sunlight, wind, etc.



- Avoid unwanted attention or distractions, crowds, other drone pilots, etc.
- Stay clear from roadways, highways, railways, etc.
- Avoid unwanted human attention or distractions, crowded areas, etc.
- Area cleared and secured from dangerous wildlife (e.g. poisonous snakes)
- Properly sheltered from extreme cold or hot temperatures, UV rays, etc.
- Find stable ground

Determine best and safest take-off and landing points

Determine best time-of-day to accomplish drone flight mission

- Factor-in weather conditions, lighting, etc.

Determine total distance or zone that needs to be covered

Determine time estimate needed to cover round-trip distance or flight zone

- Determine best flight trajectory (if available, recall previous flight path)
- How much flight time does one fully charged battery offer?
- What factors, if any, will affect total flight time, e.g.:
 - Wind, drone payload weight, extreme temperature
- Determine best drone flight altitude
- How many batteries are needed to cover the full distance, zone, or project?
- How long does it take to charge one battery to full capacity?
- How many battery chargers will you bring, if any?

Note: always use full charged drone batteries





PRE-FLIGHT MAINTENANCE & PLANNING

Drone, drone parts, and drone equipment checklist:
Visible take-off and landing pad
Ground station/drone remote controller
Peripheral devices (tablets, LCD screens, smartphones, laptops, etc.)
Drone payload or lens proper to flight mission (4K UHD, thermal, night vision, etc.)
Drone carrying case or bag appropriate to circumstances of drone flight mission
Spare batteries required to complete full drone flight-mission
Proper number of drone battery chargers for drone flight mission
Spare batteries for drone ground station/remote controller, peripheral devices, etc.
Power inverter(s), adapter(s), etc. appropriate to energy source/outlet (e.g. car)
Spare drone(s)
Spare drone parts:
Drone propeller set(s)
Drone motor(s)
Electronic Speed Controllers (ESCs)
Drone tool kit:
Wrenches fitted to drone screws
Needle-nosed pliers
Spare drone screws, nuts, and bolts
First Aid kit
Signal transmission amplifier
Ground station anti-reflective/sunshield
Set drone's home/take-off point
Remove drone camera lens protector
Remove gimbal clamp



Ensure Secure Digital (SD) card is properly inserted in the drone

Verify transmission signal/satellite strength

Drone propeller arms and propellers:

Propeller arms properly affixed or snapped into place

CCW and CW propellers installed on respective CCW and CW motors

Drone propellers tightly secured

Drone propellers able to move unobstructed

Propellers safely tightened and secured to propeller arms

Propellers free to move without abnormal resistance

Drone compass properly calibrated

Drone battery properly fitted and secured; check battery temperature

Antennas flipped into proper position

Conduct a close, top-down, clock-wise visual inspection of drone fuselage for small cracks

Conduct close, clockwise visual inspection of each drone propellers for small bends or cracks



TAKE-OFF

Power-on the ground station/remote controller first

Power-on the drone second

Conduct a 30 seconds to 1 minute test flight to ensure all systems are go

Carry-out drone flight mission according to plan



LANDING

When and where possible, land drone before low-battery alert or other fail-safe system

When and where possible, avoid fully draining drone batteries

Engage auto-landing procedure according to your drone user manual

Alternatively, use drone controls to manually land your drone using appropriate speed

Make necessary manual adjustments to your drone's landing flight trajectory

Aim to land your drone on a well-marked, visible landing pad located in a safe and clear area

Maintain awareness of landing environment and variables that may affect landing (e.g. wind)

If no auto-turn off, manually-turn off all systems upon safely touching ground and landing



IN-BETWEEN FLIGHTS

Ensure all systems are powered-off; safely remove drone battery

Carefully examine and inspect each propeller for the most minute scratch, wear, and tear

Tighten and secure any loose screws (flight vibrations may loosen screws)

Check all parts and components for signs of stress fractures or cracks

Verify that all wires are tightly connected (flight vibrations can loosen connections)

Replace drone battery with fully charged extra battery

Clean/whip drone camera lens

Allow sufficient time (approximately 5 minutes) for motors and ESCs to cool-down

Keep all drone motors dry and dust free; if necessary, use canned air to clean motors



OFF-DAY MAINTENANCE: BATTERY CARE +

***IMPORTANT NOTICE: DEFER TO MANUFACTURER AND/OR REGULATOR-SPECIFIC INSTRUCTIONS**

Always use fully-charged drone batteries

Avoid fully draining drone batteries; when safe to do so, land before low-battery alert

Avoid removing battery while drone is powered on

Always remove battery from drone when not in use

Avoid charging batteries immediately after use; allow cool-down before charging

Avoid charging batteries outside manufacturer-recommended temperature range

Charge battery at full capacity; refraining from overcharging

Never leave batteries charging overnight
Unless otherwise specified by manufacturer, charge battery at room temperature
Avoid storing drone in direct sunlight
Store battery in cool, dry environment, away from flammable objects or liquids
Store batteries in room with functional smoke detector, fire extinguisher, or sprinkler system
When traveling, store batteries in travel case appropriate to the circumstances
If traveling by plane, verify latest airline policy regarding battery storage
Always avoid battery contact with wet surfaces or liquids
Don't leave drone batteries fully charged for more than two (2) days
Optimize battery life by fully charging and discharging battery every three (3) months



DRONE TOOLS + ACCESSORIES

Screw driver(s) fitted to drone screws found on various parts and components of your drone
Spare screws, nuts, and bolts fitted to various parts and components of your drone
Isopropyl alcohol for cleaning dust and debris from sensitive drone surfaces
Canned/compressed air for cleaning dust and debris in tight or confined areas
A micro fiber cloth for whipping motors, propellers, lenses, and other sensitive areas
3-in-1 lubricant for motors and other moving parts and components (never use oil)
Soldering iron and accessories for wiring and other fixtures
Spare battery(ies)
Battery charger(s)
Drone and battery charging cables
Spare set of drone propellers
Lanyard
Drone landing pad
FPV/3D drone goggles
Drone and battery carrying backpack, bag, and/or case

Allen keys (Hex Screw Driver set)
Micro SD Cards
GPS Tracker
Screw drivers set
Hex Nut Driver/wrench
Wire cutters and wire strippers for cutting wires and other components
Pliers for nut wrench or for gripping components while working on others
Electrical Tape for sticking electrical components together
Double-sided damping foam tape for sticking parts together
Scissors
Old toothbrush with soft bristles to clean dust, dirt, and other debris
Multimeter for checking voltage, resistant and current
Lighter for heat shrinking
Utility knife or box cutter to help with removing certain contents
Hot glue gun or epoxy glue
Liquid electric tape with waterproof coating
Sand paper for smoothening surfaces and edges
Servo tester to test motors, electronic speed controllers, etc.
Vernier Calliper/digital ruler for precise measurements
Digital scale
Propeller balancer
Clamp meter to measure currents
Dremel took kit for cutting drilling, polishing
Motor Thrust Station
Oscilloscope to measure electrical signals and noise
Adjustable Power Supply
Junior Hacksaw

Zip ties for securing various parts and components to your drone

Spare silicon electrical wires

Servo extension wires for connecting components together

XT60/JST connectors for lithium polymer batteries

Spare motor(s)

Lock nuts

Vibration absorbing foam