Field Operations Procedures

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RPSearch Services P.O. Box 470, Wimberley, TX 78676

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Introduction

It is the intent of RPSearch Services to provide technological support in the form of unmanned aerial systems (UAS) to agencies that do not currently have the capability, nor foresee obtaining it in the near future. All procedures contained herein are derived from the RTCA SC203 Best Practices document and certification to RCAPA level AP-P. RPSearch Services is a non-profit (IRS 501(c)3) organization that receives no direct compensation for its' operations.

This document shall provide best practices and internal procedures for the safe operation of its' UA's in all environments it may be asked to participate in.

Personnel qualifications

Pilot in Command (PIC)

The PIC shall be the individual with responsibility for all other personnel involved with the operation. For clarification, this section will include both the Pilot in Command and the Pilot at the Controls although they may both be interchangeable in most circumstances. The PIC shall have the minimum qualifications;

1. Knowledge of general aviation practices and FARs (optional private rating)
2. National Incident Management System Certification 100, 300, & 700 level
3. 20/20 corrected vision
4. Familiarity and operations of Spectra and Stryker aircraft to include;
    a. At least three events utilizing one, or both UA
    b. At least three take offs and recoveries within 90 days with type
    c. Familiar with the latest revision of ground control software
    d. Emergency recovery procedures in failed link situations
5. Familiar with the qualification requirements of all subordinate personnel
6. Familiar with communications protocols in an NIMS/ICS environment
7. Familiar with mission planning and preflight procedures
7. Versed in emergency procedures and contingency operations
8. Familiar with acceptable field repair and maintenance procedures

Pilot at controls (PAC)

1. Knowledge of general aviation practices and FARs (optional private rating)
2. Maintain and hold an RCAPA rating of AP-P as available
3. National Incident Management System Certification 100, 300, & 700 level
4. 20/20 corrected vision
5. Familiarity and operations of Spectra aircraft to include;
    a. At least three events utilizing one, or both UA
    b. At least three take offs and recoveries within 90 days with type
    c. Familiar with the latest revision of ground control software
    d. Emergency recovery procedures in failed link situations
6. Familiar with mission planning and preflight procedures
7. Versed in emergency procedures and contingency operations
8. Familiar with acceptable field repair and maintenance procedures

Ground System Crew

1. National Incident Management System Certification 100, 300, & 700 level
2. 20/20 corrected vision
4. Familiarity and operations of Spectra aircraft to include;
      a. Familiar with the construction and configuration of each UA
      b. Familiar with GCU electronics and configuration
      c. Familiar with field repair procedures for each UA
      d. Familiar with the latest revision of ground control software

Observers

1. National Incident Management System Certification 100, 300, & 700 level
2. 20/20 corrected vision
3. Familiar with emergency recovery procedures in failed link situations

Airframes

The airframes are based upon a proven design that has been developed over the last 5 years by RPFlight Systems, Inc. The materials incorporated are new and electronics are off the shelf components that are new and of well known manufacture. The aircraft are designated for visual line of sight operation (VLOS) only and have pilot assist circuitry for some flight control functions other than built in failsafe modes in the standard control receiver utilized. As configured, the aircraft would be no more than ½ to 3/4 of a mile laterally from the pilot at the controls. Each aircraft of type is flight tested in an isolated area to ensure airframe structure and propulsion capability are sufficient for the intended payload, operating environment, and maneuvers required before it will fly any mission stated herein.

Configuration

Spectra

Aircraft Type: Spectra AP flying wing
Manufacturer: RPFlightSystems, Inc.
Construction: EPS foam/ABS/composite
Aircraft Empty Weight: 31 oz.
Aircraft RTF AUW: 47 – 54 oz.
Propulsion: Electric outrunner
Power : 4200 MaH lithium polymer flight batteries
Onboard electronics: Autonomous pilot system with failsafe, Eagle Tree
     Telemetry
Optics :   (1) still E/O imager, up to (2) video CCD video cams, 2.4Ghz.
Launch Type : Hand launch
Landing Type : Skid, net retrieval
Launch Speed : 15 mph
Cruise Speed : 32-34 mph (@ 75% power)
Cruise Speed : 28 mph (@ 50% power)
Landing Speed : 15 mph
Stall : 14 – 18mph (depending upon wing loading)
VNE : 75 mph
Duration : 45 minutes (5K MaH battery, 50% power)

Mission Selection

RPSearch Services recognizes that each mission has its' own unique circumstances that may affect the operation of the UA, safety factors, and personnel involved.

Search and Rescue/Recovery

Search and Rescue operations range from small singly controlled units to multi agency units requiring coordination and close dissemination of information. The PIC will consider the following factors before authorizing any launch of either UA for the purpose of Search and Rescue;

1.   Weather
        When possible, the RPSS PIC shall contact the closest flight service station for weather in the immediate area of operations. In lieu of that source, the local source of weather may be utilized through the internet, or may be observed on site. The PIC shall have final determination of risk due to weather and authority over launch of any RPSS aircraft

2.   Hazards to the public
        The RPSS PIC shall make every effort to ensure that flight operations will not pose any undue risk to the public not directly involved with the effort. The PIC shall have final determination of risk to the public and authority over launch of any RPSS aircraft

3.   Hazards to property
        The RPSS PIC shall make every effort to ensure that flight operations will not pose any undue risk to any property in the area involved with the effort. The PIC shall have final determination of risk to the property and authority over launch of any RPSS aircraft

4.   Hazards to personnel
        The RPSS PIC shall make every effort to ensure that flight operations will not pose any undue risk to the personnel directly involved with the effort. The PIC shall have final determination of risk to the public and authority over launch of any RPSS aircraft

5.   Proximity to controlled airspace
        The PIC shall ensure that all unreported operations take place at least three (3) miles from any controlled airspace. Operations inside any controlled airspace shall only be performed with permission of, and in constant communication with, the controlling authority of the airspace. The PIC shall have final authority over launch after clearance has been granted by the controlling authority. The controlling authority maintains the right to abort any RPSS flight operation regardless of the stage that operation is in.

Law Enforcement Support

In addition to the above stated considerations for Search and Rescue, additional considerations for law enforcement support shall be:

1.   Covert operations affecting safety
        The PIC shall have final authority of launches and flight operations involved in covert operations that could preclude any safety consideration to maintain the mission's secrecy. No convert operations shall be conducted that subvert any stated safety consideration.

2.   Evidence handling and security
        RPSS personnel directly involved with evidence gathering shall not subvert any of the safety rules stated to perform flight operations.

Fire Support

RPSS fire support activities are confined generally to wildland fire control and post fire mop up. In the event that an Incident Command is established, the RPSS PIC shall report directly to the Incident Commander and defer resource authority to that position. Additional considerations for fire support include:

1.   Safety of full size aircraft involved in support operations
        Fire incidences typically involve the use of spotter aircraft and aircraft that deliver fire retardants and water at altitudes operated in by RPSS aircraft. The PIC shall defer to any incoming aircraft reported by the Incident Command, Air Boss, or RPSS observers. All RPSS UA flight operations shall cease and aircraft will land until the full size aircraft are clear of the area.

2.   Safety of RPSS personnel
        At no time shall the PIC allow any RPSS personnel to place themselves or any RPSS resource in danger. The PIC shall defer to the Incident Commander in all situations when an ICS situation exists.

Disaster Recovery Support

Almost all Disaster Recovery Support operations shall be controlled by a NIMS Incident Command System. The RPSS PIC shall report to the Incident Commander with a list of all resources that can be made available for the situation. Regardless of authority, the RPSS PIC has final authority for all launches of RPSS UA.

Other agency missions

Other agencies could include NTSB, DOT, Dept. Agriculture, DEA, FBI etc. and could pose additional safety considerations. The PIC shall have final authority over the execution or attempt of any flight operations by RPSS personnel and UA.

Launch and Landing Zones

Launch Site Selection

Launch site selection shall be driven by safety first and foremost. Selection of launch sites will be considered based upon :

1.   Ability to maintain adequate buffer zones between aircraft and personnel
      RPSS personnel shall maintain a buffer of at least 50 feet between aircraft
      operations and all non-essential personnel. RPSS observers shall act as safety
      supervisors while not performing the duty of in flight observer. Emergency
      management personnel, law enforcement, or other PIC designees may augment
      RPSS with proper on site instruction for crowd control.

2.   Communications with the requestors and their personnel
      RPSS shall maintain communications with the authority requesting the flight
      operation. The communications may be made verbally if within proximity, via
      cell phone, or by tactical radio as required. The requesting authority shall provide
      final permission over all launches. If the requesting authority grants independent
      flight operations, the PIC shall have full authority of all launches.

3.   Environmental Assessment
      No launches shall occur until all environmental assessments have been
      considered. RPSS personnel have final authority to abort any launch based upon
      hazard to the environment, themselves, or other personnel in the area.

4.   Departure over sparsely populated corridors
      The RPSS PIC shall make every effort to select a launch site that minimizes
      departures over populated areas. If flights over populated areas must take place
      the PIC shall plan each flight to minimize the time over areas of concern.

Landing site & Alternate landing sites

1. Primary Landing site
Typically the primary landing shall be the same as the launch site. The PIC has final authority for any approaches to the primary site and may wave off any approach deemed unsafe.

2. Alternate landing sites
The RPSS PIC shall designate at least one alternate landing site. In the event that a wave off is not possible and the primary landing site is deemed unsafe, procedures to utilize the secondary site will be invoked.

3. Mission Abort Sites
The RPSS PIC may optionally designate an "abort site" whereby the aircraft may be "dumped" in an emergency situation. The abort site shall be so far removed as to provide absolute minimal risk should the aircraft be required to vacate airspace in an emergency. Should the PIC deem it necessary the UA may flown to this site and inserted without regard to the safety of the aircraft or flight equipment.

4. Approaches over populated areas.
The RPSS PIC shall make every effort to select a landing site that minimizes approaches over populated areas.

5. Landing Safety & Crowd control
All landing sites shall be maintained and operated as the launch sites. RPSS personnel shall maintain a buffer of at least 50 feet between aircraft operations and all non-essential personnel. RPSS observers shall act as safety supervisors while not performing the duty of in flight observer. Emergency management personnel, law enforcement, or other PIC designees may augment RPSS with proper on site instruction for crowd control.

Preflight, Takeoff, and Post flight Checklists

Primary Responsibility

Preflight activities are completed and verified by the PIC before takeoff, generally upon arrival at the location and the operation is to be performed. Activities in this segment refer to all knowledge gathering, area assessment, and actions performed on the aircraft before taxi or takeoff. These include inspection of aircraft, assessment of the operating location, and coordination with other crewmembers involved in the operation, and equipment checkouts.

Mission Plan

The mission plan shall contain all actions and contingencies for the mission planned. Any limiting factors in the flight environment may alter the intended operation and modify the mission plan accordingly. Contingency planning should include safe routes in the event of a system failure, degraded performance, or lost communication link, if such a failsafe exists.

Airframe

The airframe shall be given a thorough inspection thru the use of a checklist. The content of the checklist will be as follows:
Before the first flight of the day, verify all transmitter, on-board aircraft, and camera batteries are fully charged.
Check all control surfaces for signs of damage and overall condition.
Check that control linkages are secured and condition of control horns and brackets.
Check the wing to make sure it is in good structural condition and properly secured and aligned to the airframe.
Check the motor/engine and mounting system to make sure it is firmly attached to the airframe.
Check the propeller or rotor blades for chips, cracks, looseness and any deformation.
Check the landing gear (if applicable) for damage, for secure attachment, and the wheels are in good shape and rotate freely.
Check that the servos are firmly attached to the airframe and all receiver connections are secure.
Check all electrical connections making sure they are plugged in and secured to the airframe.
Check that the photography equipment and mounting system are secure and operational.
Perform an overall visual check of the aircraft prior to arming any power systems.
Repair or replace any part found to be un-airworthy prior to take-off.

Flight Control/Ground station

1. Ensure there are no frequency conflicts by use of frequency scanner before turning on transmitter.
2. Make sure that all of your body parts, clothing, other obstructions, and bystanders are well away from any propeller or rotor and its arc before turning power on to any systems. Make sure the aircraft is secure and will not move if the motor was suddenly powered up.
3. Announce out loud - "CLEAR PROP".
4. Turn on the transmitter. If it displays information such as aircraft memory and battery voltage, be sure these numbers are correct.
5. Make sure that the throttle stick on the transmitter is in the power off position.
6. Connect the battery and/or turn on the power switch to the aircraft.
7. Follow the recommended range test procedures as outlined in your radio transmitter/receiver owner's manual.
8. Check for proper operation of control surfaces.
9. Check that all servos are steady and not chattering or making any other abnormal noise when in operation or idle.
10. Check the motor/engine for proper operation. Firmly secure the aircraft and gradually increase the throttle to full power and back down to idle - checking for lack of thrust, vibration or other possible anomalies. Check that the motor stops completely when the throttle stick is at the off position.
11. Ensure the triggering device is working correctly.

Before Take Off:

1. Confirm transmitter antenna is fully extended.
2. Confirm transmitter trims settings in proper position.
3. Confirm receiver antenna is fully extended.
4. Check that the take off area is clear of obstructions and people.
5. Double check weather conditions and review potential emergency landing areas.
6. Set flight timer alarm.
7. Announce out loud - "PREPARING TO TAKE OFF".
8. Launch aircraft.

In-Flight:

1. Climb to a safe altitude away from potential hazards and check control systems. Reset trims if necessary.
2. Keep aircraft at a safe operating distance from people and buildings.
3. If aircraft must be flown over buildings or people, maintain a safe altitude for recovery & make every effort to minimize exposure.
4. Continually scan the flight and ground areas for potential hazards.

Landing:

1. Check the control systems and set the trims that if necessary, an emergency abort landing can be made.
2. Scan landing area for potential obstruction hazards and recheck weather conditions.
3. Announce out loud - "PREPARING TO LAND".
4. Always be prepared to go around.
5. Carefully land the aircraft away from obstructions and people.

Post-Flight:

1. Turn the power off to the aircraft and/or disconnect the batteries.
2. Turn off the transmitter.
3. Turn the power off to the photo equipment.
4. Visually check aircraft for signs of damage and/or excessive wear.
5. Remove the unused fuel if applicable.
6. Secure the aircraft.

In flight Operations

Flight Clearance & Authorization

In the event that RPSS personnel are given the task of independently performing missions, or the absence of a formal Incident Command, the PIC shall have full authority for all flight operations. The PIC will be solely responsible for the conduct of the ground crew and observers before, during and after the flight while on duty. The PIC shall also ensure that all standards of safe flight are met before authorizing launch of any aircraft.

Ground Crew & Observer Communications

Ground crew and observer communications shall be kept to a minimum and shall focus on the mission at hand. Communications not directly affecting the outcome of the mission should be avoided so as to not distract the PAC from his/her assigned duties.
The use of two radios with a VOX capability will be utilized when possible. Cell phone communication may be utilized when it is reliably available but radios will be on standby for backup.

NIMS & IC Interface

ICS accountability

If an Incident Command structure is implemented on any mission involving RPSS personnel, the PIC shall report directly to the situation Incident Commander with a full disclosure of assets available. The PIC shall defer authority for flight clearance to the Incident Commander or a designated Air Boss within the IC command structure unless a safety situation that the Incident Commander may not be aware of arises. In that case, the PIC must halt flight operations and report immediately to the IC (or Air Boss) for further instructions. Regardless of authority, no RPSS UA shall impinge, interfere, or hinder any full size aircraft entering into proximity of the operation.

ICS communications

All communications in a IC structure shall be the proscribed method of the incident which may two radio, cell phone, or face to face. Regardless of method, communication between the PIC, ground crews, and incident command shall be conducted in plain English. All personnel should reduce the amount of codes and jargon to an absolute minimum to ensure clarity of information transmitted.   RPSS flight personnel shall not disclose any information to parties outside the responding agency concerning the mission or the payload unless it has been approved by the ICS Public Information Officer (PIO)

Permissions

In order of hierarchy, flight authorizations will come from the following:

1. Area Command – in a multi-agency oriented incident
2. Situation Incident Command – in a local incident
      a. Incident command may designate a "Flight boss"
3. Pilot in Command – in an independent operation.

Field Maintenance and Repairs and Logbooks

Field Repairs

After recovery of the aircraft, if an inspection should reveal any damage, the PIC may authorize the field repair of the aircraft. Field repairs can consist of two types, critical and non-critical.

> 1. Non-critical repairs are repairs made to the airframe or components that are not critical to the flight control or function of the aircraft in its assigned mission. Repairs of this nature are patches to covering, replacing fairings or cowlings, or repairs that enhance the mission payload.

> 2. Critical repairs or those repairs that must be made that directly affect the ability of the aircraft to perform its function and to continue the mission. Typical repairs of this nature would be such as replacing a motor, or replacing a fight control servo.

Logbooks

Logbooks shall be utilized in every flight operation. The logbook may be consulted to ascertain any condition the PIC might need to be aware of concerning behavior of the aircraft or past repairs made to the aircraft. An entry into that aircrafts logbook shall be completed after every landing cycle, regardless of outcome.

Clearing the scene

Personnel accountability

> The PIC shall be responsible for the safe accounting of all flight personnel and observers. In the event of an incident command, every person involved in flight operations shall be checked into the IC by full name and time on scene. At the completion of mission operations, the PIC shall ensure that all personnel are CHECKED OUT by full name and time out with the IC before departing the scene.

Environmental considerations

> RPSS personnel shall leave as small an environmental footprint as possible. The immediate area around the flight operations shall be policed for equipment, personal items, or trash. Any material that was removed to make way for flight operations shall be returned and re-established as it was found.

Media Interface

Incident Public Information Officer

In the event an ICS is established, all information made available to the media concerning flight operations and payload shall be cleared through the incident command Public Information Officer (PIO). If an Area Command is established, the area command PIO shall clear all information made available to media.

Internal media interface

In the event independent operations are underway, the PIC shall act as the liaison between the flight team and media. It is advisable in every case to divulge as little as possible to the media concerning operations of the aircraft and the payload.