



DANNY E. BRADLEY  
CHIEF

# POLICE DEPARTMENT



200 WEST PERSHING BLVD.  
NORTH LITTLE ROCK, ARKANSAS 72114-2204

PHONE: (501) 758-1234  
FAX NUMBER: (501) 771-7157 (SERVICE)  
FAX NUMBER: (501) 771-7194 (CHIEF)

## Public aircraft:

The Rotomotion SR30 aircraft will be owned and operated by the City of North Little Rock as a public aircraft. The City acknowledges and accepts all responsibility for insuring the aircraft is airworthy.

The Department of Defense Handbook *Airworthiness Certification Criteria MIL-HDBK-516B* (The Handbook) was used to review the airworthiness of the Rotomotion SR30 rotary wing aircraft.

The North Little Rock Police Department has determined the Rotomotion SR30 UAS is airworthy when used in accordance with the manufacturer's recommendations.

## Methodology for airworthiness determination:

The Handbook criteria were reviewed to determine what criteria are applicable to small unmanned rotary winged UAS aircraft. The criteria cited 14CFR Part 23 and Part 25 which apply to airplanes. References to Part 23 were changed to Part 27 which deals with normal category rotorcraft. 14CFR Part 27 was then reviewed for applicability to a small unmanned rotary wing UAS aircraft. From the review of The Handbook and part 27 a set of criteria applicable to the Rotomotion SR30 was developed. That criteria was then used to review the airworthiness of the Rotomotion SR30 aircraft.

Captain  
Investigations Division Commander

#### Lost link procedures:

The GCS creates and sends a "watchdog" data packet to the UAS every second. Via the GCS the pilot in command (PIC) sets the link failsafe parameters (failsafe recovery location, altitude, and transit speed) and the time to failsafe in seconds. The failsafe time out is user selectable between 10 and 30 seconds. The North Little Rock Police Department has selected 10 seconds as the fail safe timeout. The maximum speed of the UAS is 35 knots. The department has selected 10 knots at the failsafe transit speed. When the link is down for the specified period of time, the failsafe behavior triggers and returns the UAS to the failsafe recovery location programmed for the mission. In practice, this point is close to the area where the UAS operations are taking place. Generally once the UAS is returning to the GCS location via the failsafe system the link will reestablish. If the link is not reestablished, the safety pilot can preempt the flight control system and the GCS operator (PIC) by means of a switch on the 72MHz safety transmitter. The safety pilot assumes the role of observer and PIC at this point. If the UAS is in visual range of the GCS operator, the GCS operator assumes the role of additional observer. The safety pilot then has manual control of the aircraft and can land it manually, either at the planned recovery point or any suitable location near the flight path. The UAS is not permitted to fly beyond the range of the safety pilot (either the range of the safety controller, or the range the safety pilot can effectively control the UAS).

As part of the mission planning procedures alternate emergency manual control landing locations will be identified along the planned flight path.

#### Lost link parameters:

Failsafe timeout: 10 seconds

Failsafe recovery location: To be determined as part of mission planning.

Failsafe altitude: 300' AGL

Failsafe transit speed: 10 knot

Recovery point hover altitude: 15'

Emergency manual landing sites: To be determined as part of mission planning.

#### Fly away potential:

The UAS has a low potential for uncontrolled fly away. During mission planning the flight profile is loaded into the UAS flight control system. After loading the flight profile the GCS is only necessary for control of the UAS in the event the UAS flight path needs to be changed during the mission and during landing operations. The flight profile includes a preplanned recovery point in the event of lost link. If lost link occurs the UAS autonomously returns to the recovery point while seeking to reestablish the link. If the link is not reestablished the UAS enters hover upon reaching the recovery point, descends to the recovery point hover altitude and awaits manual control to a landing. In the event of a flight control system failure, the UAS is equipped with a manual control system utilizing a standard radio control system operating on an approved 72 MHz model aircraft

control frequency. In the event of a flight control system failure the safety pilot becomes the UAS PIC and manually controls the UAS to a landing at a suitable location.

The Rotomotion SR30 UAS is a rotary wing UAS. Unlike fixed wing aircraft which are typically stable, the SR30 rotary wing UAS is inherently unstable and requires constant minor adjustment to maintain flight. In the event of a total flight control failure, (total loss of the onboard automatic flight control system, total loss of flight control system backups, and total loss of the backup manual safety control system) the aircraft becomes unstable and will end flight typically 20 to 30 yards from where total flight control failure occurs.

## Lost communications procedures

The pilot in command (PIC) and observer(s) will be equipped with 800 MHz trunked public safety radios for direct communication. The radios are equipped with access to a conventional non-trunked repeater system in a separate physical location. The pilot and observers will also be equipped with departmental issued cell phones. The PIC will have an aircraft band radio tuned to the local ATC frequency and a second aircraft band radio tuned to the guard frequency.

In the event of loss of the trunked radio system UAS crew members will immediately switch to the backup non-trunked system. The mission will be allowed to continue.

In the event of a radio failure (public radio direct communications system) the PIC and primary observer will immediately initiate a cell phone call. The mission will be terminated and the UAS commanded to return to the recovery point and land.

In the event of a failure of the aircraft band radio (loss of communications with ATC) the PIC will announce termination of the mission and command the UAS to return to the recovery point and land. The PIC will utilize a department issued cell phone to make contact with ATC as required.

## Emergency procedures

### Lost Link

Terminate the mission. Failsafe triggers after timeout and the UAS returns to the programmed failsafe recovery point. If link is regained, PIC commands auto land. If link is not regained the safety pilot takes manual control and lands the UAS.

### GCS computer hardware or software failure

Terminate the mission. Failsafe triggers after timeout and the UAS returns to the programmed failsafe recovery point. The safety pilot takes manual control and lands the UAS.

### Video/Camera failure

Terminate the mission. The pilot in command (PIC) commands the UAS to return to the recovery point and auto land.

### Automatic flight control system failure

Terminate the mission. The safety pilot takes manual control and lands the UAS.

### Engine failure

The safety pilot takes manual control. Maneuver to as safe an area as possible, land vertically.

### Magnetometer failure

Terminate mission. The safety pilot takes manual control and lands the UAS.

### Artificial horizon failure

Terminate the mission. The safety pilot takes manual control and lands the UAS.

### Poor GPS reception

Terminate the mission. The PIC commands the UAS to return to the recovery point and auto land.

### GPS failure

Terminate the mission. The safety pilot takes manual control and lands the UAS.

### Lost Communications PIC to observer

See lost communications procedures.

### Lost communications PIC to ACT

See lost communications procedures.