

RAVEN and WASP
UNMANNED AIRCRAFT SYSTEMS (UAS)
STANDARD OPERATING PROCEDURES (SOP)

FOR

STENNIS SPACE CENTER BUFFER ZONE, MISSISSIPPI

A. INTRODUCTION. This document covers UAS operations within the Stennis Space Center Buffer Zone, MS. This SOP will be used in conjunction with an approved Federal Aviation Administration (FAA) Certificate of Waiver or Authorization (COA) for operations at Stennis.

One Pilot in Command (PIC) must be designated at all times and is responsible for the safety of the Unmanned Aircraft (UA) and persons and property along the UA flight path. The PIC maybe a Vehicle Operator (VO) or Mission Operator (MO). The PIC will be held accountable for controlling their aircraft to the same standards as the pilot of a manned aircraft. The provisions of 14 CFR 91.13, Careless and Reckless Operation, apply to UAS pilots.

Unmanned Aircraft System (UAS) operations at Stennis IAP will be conducted within the airspace approved in the FAA COA (see figure 1). Operations will be conducted approximately 3 times a week, approximately 6 one hour sessions. Operations will be conducted in VMC during the hours of sunrise to sunset. For WASP UAS operations the visual observers will remain in contact with the PIC and will be positioned so that they remain within .5 nautical miles laterally and 500 feet AGL vertically of the WASP UA during all operations. For RAVEN UAS operations the visual observers will remain in contact with the PIC and will be positioned so that they remain within .5 nautical miles laterally and 1000 feet AGL vertically of the RAVEN UA during all operations. The PIC will not over-fly heavily traffic roads or any populated areas.

B. FLIGHT SCHEDULING. UAS operations within the Stennis Buffer Zone will be coordinated a minimum of 24 hours prior with NASA Safety, Stennis ATC Tower, and Keesler AFB Command Post (see figure 2). The PIC will coordinate with Stennis Base Operations to request a NOTAM be issued detailing UAS activity within the Stennis Buffer Zone to include mission dates and times. Stennis Base Operations contact number is: 228-467-7070.

The schedule shall include, at a minimum, the following for each flight:

1. Takeoff time (all times local)
2. Estimated land time
3. FM Net call sign of observer: (_____)
4. Observer name or initials
5. Observer cell phone number (back-up comm)

C. FREQUENCY AUTHORIZATION AND DECONFLICTION. The PIC is responsible to ensure all UAS frequencies are coordinated with the appropriate DoD Area Frequency Coordinator for deconfliction and approval. For Stennis ops, the Gulf Area Frequency Coordinator is [REDACTED] **Exemption 6**

D. STENNIS BUFFER ZONE UAS PROCEDURES. The PIC, observer, or designated team lead will:

1. Coordinate WASP or RAVEN operations with Stennis ATC Operations facility personnel and monitor appropriate frequencies as directed by ATC.
2. Pass/verify phone numbers for Stennis Base Operations and ATC tower personnel
3. Provide a WASP or RAVEN flight schedule for that day's UAS operations.
4. Ensure that a NOTAM has been issued.
5. If requested to monitor a frequency -- conduct a radio check one-hour prior with the Stennis ATC Tower to ensure the radio is operational, and loud and clear. Communications will be maintained throughout the operation. UAS operators shall comply with all instructions and restrictions given.
6. Remain within the confines of Stennis COA defined airspace.
7. Operations are not allowed over populated areas.
8. Operator will NOT over-fly heavily trafficked roads.
9. All operations will be conducted between sunrise and sunset in VMC; the UAS will remain clear of clouds and other weather obstructions.
10. Ensure the WASP remains within .5 nm laterally and 500 ft AGL (1000 ft AGL for RAVEN) vertically of the operators/observers and maintain visual contact with the UA.
11. **LOST LINK setting will always be set to "GO TO RALLY" to ensure the UA remains within the approved COA airspace.**
12. Cease UAS operations if directed by Stennis ATC or any other NASA authority.

E. PRE-FLIGHT BRIEFINGS. Prior to any WASP or RAVEN UAS operations, the PIC will conduct a crew and safety briefing. The briefing will include, at a minimum, the following:

1. **Mission overview.**
2. **Weather.** (current and forecasted)
3. **Flight route/area.** Ensure Stennis Buffer Zone operations area is loaded in Falcon View.
4. **Airspace surveillance procedures.**
 - a. Pilots responsibilities.
 - b. Observers responsibilities.
 - c. Pilot responsibilities in the event of ATC notification of observed aircraft in vicinity of UA operations not in two-way communication.
 - d. Pilot/Observer responsibilities when they observe an aircraft in vicinity of UA operations.
5. **Required items, mission equipment, and personnel.**
6. **Crew actions, duties, and responsibilities.**
 - a. Modes of flight, who will make radio calls, identification of recovery team, etc.
 - b. Emergency actions.
 - (1) Mission considerations.
 - (2) Actions to be performed by VO/MO.
7. **General crew duties.**
 - a. Vehicle Operator (VO).
 - (1) Fly the air vehicle.
 - (2) Avoid traffic and obstacles.
 - (3) Cross check display symbology, messages, wind velocity/ direction.

b. Mission Operator (MO)

- (1) Assist in traffic and obstacle avoidance.
- (2) Manage radios.
- (3) Navigate.
- (4) Cross check display symbology, messages, wind velocity/direction
- (5) Read and complete checklist items as required.
- (6) Set/adjust pages/switches and systems as required.
- (7) Note takeoff time.
- (8) Log events
- (9) Calculate and monitor times for holding and approaches.
- (10) When on approach, watch for the air vehicle.
- (11) Be prepared to direct the VO for a missed approach procedure, if required.
- (12) When visual is acquired direct VO to the ground if needed.

c. Observer

- (1) Must remain within .5 nautical mile laterally and 500 feet vertically (WASP), 1000 feet AGL vertically for RAVEN, of the UA during all operations.
- (2) Must keep the UA in sight at all times.
- (3) Maintain two-way contact with the VO/MO to warn of potential hazards.
- (4) Provide VO/MO with instructions to steer clear of any potential collisions.

8. Analysis of the aircraft. Logbook and preflight deficiencies.

9. Risk assessment considerations.

10. Comments: Instructor, Mission commander, Crew member, Observer questions, comments, and acknowledgment of the mission briefing.

F. PRE-FLIGHT PROCEDURES. UAS are particularly sensitive to adverse weather conditions such as moderate to blowing sand and dust, rain, severe turbulence, storms and lightening, and wind gusts. WASP and RAVEN operators will be responsible to routinely check current and forecasted conditions. It will be the responsibility of the PIC to ensure weather conditions do not exceed system limitations as described in Operator's Manual. All flight operations will be conducted in Visual Meteorological Conditions (VMC) under Visual Flight Rules (VFR). The PIC will complete the Preflight checklist in Operator's Manual.

G. LAUNCH and FLIGHT. The PIC will complete, at a minimum, the following:

1. Follow procedures outlined in Operator's Manual.
2. If requested by Stennis ATC, inform Stennis tower via FM Net that the WASP or RAVEN is airborne.
3. The UA shall remain within COA designated airspace at Stennis Buffer Zone (figure 1).

H. POST FLIGHT PROCEDURES. The PIC will complete, at a minimum, the following:

1. Notify Stennis ATC tower personnel upon completion of each sortie
2. Inventory and account for all equipment
3. Report any discrepancies
4. Conduct a visual and functional equipment inspection
5. Complete an entry to the flight log
6. Last flight of day. Notify Stennis Base Operations and ATC tower personnel upon completion of the day's activities.



Figure 1. WASP and RAVEN operation area / Stennis Buffer Zone / Class G Airspace

Note: Altitude for WASP is at or below 500 ft AGL. The RAVEN altitude is at or below 1000 ft AGL except under the Picayune Class E airspace which the RAVEN will remain at or below 500 ft AGL.

I. EMERGENCY PROCEDURES. Preventing a mishap or UA loss or damage depends on early recognition of dangerous flight conditions or malfunctions followed by appropriate corrective action. Both the VO and MO will memorize the immediate action items of each emergency procedure outlined in the WASP or RAVEN Operator's Manual. Mission planning must include alternative courses of action available for each phase of the proposed flight. To the extent possible, planned courses of actions for emergencies should be made before the flight begins to include ensuring the Rally waypoint (in the event of loss-of-link) and waypoint "E" (for routine landings) are within the designated COA airspace. During flight, both operators must maintain situational awareness and VO should always know which direction to fly to escape hazard. MO: Should always know UA position relative to hazards and be ready to give VO headings and altitudes to fly to safety. Those steps that must be performed immediately in an emergency are underlined and in bold print in the Operator's Manual. The operators must be able to perform these steps without referencing the checklist or manual. Non-underlined steps can be accomplished with use of the checklist.

During an emergency, the PIC will complete, at a minimum, the following:

1. Follow procedures outlined in WASP or RAVEN Operator's Manual.
2. Immediately notify Stennis Base Operations and ATC tower personnel and advise them of the nature of the emergency situation and/or any other pertinent information.

J. MISCELLANEOUS.

1. The United States Special Operations Command and/or its representatives are responsible at all times for collision avoidance with non-participating aircraft and the safety of persons or property on the surface with respect to the UAS.
2. Incident / Accident Reporting: The following information is required to document unusual occurrences associated with UAS activities in the National Air Space System.
 - a. The proponent for the COA shall provide the following information to the individual specified in the approved COA on a monthly/annual basis (Note: reporting is not required until the first flight occurs. Then reporting must continue on a monthly/annual basis even when no flights are executed):
 - Number of flights conducted under this COA.
 - Pilot duty time per flight.
 - Unusual equipment malfunctions (hardware/software).
 - Deviations from ATC instructions.
 - Operational/coordination issues.
 - All periods of Loss of Communications.
 - All spill outs from Class D airspace.
 - b. The following shall be submitted to the FAA POC in the COA within 24 hours:
 - Deviations from the "Special Provisions" contained in the COA.
 - All periods of Loss Link, including duration.
 - All incidents involving the UAS as defined in 49 CFR 830.
 - All accidents involving the UAS as defined in 49 CFR 830.

FOR OFFICIAL USE ONLY
UAV FLIGHT CLEARANCE CHECK LIST

OP DATE: _____

UAV TYPE: _____

TRAINING LOCATION: (CIRCLE ALL THAT APPLY)		
WMA-NORTH	WMA-EAST A	WMA-EAST B
WMA-SOUTH A	WMA-SOUTH B	WMA-SOUTH C
WMA-SOUTH D		

	GO / NO GO	Initials	Date/Time
OPERATIONS OFFICER 228-813-4000 x13300			
NASA SAFETY - (b) (6) or NASA Security - (b) (6)			
STENNIS INTL AIRPORT TOWER OPS (b) (6)			
403rd Air Wing - Keesler AFB - Command Post 228-377-4181			
815th Air Wing - Keesler AFB - Command Post 228-377-5041			

Figure 2. UAS notification checklist / Stennis Buffer Zone / Class G Airspace