Headquarters
US Army Garrison Command
Fort Knox, Kentucky 40121-8113
24 March 11

Fort Knox Reg 95-23

Aviation

UNMANNED AIRCRAFT SYSTEM (UAS) FLIGHT RULES

Summary. This regulation outlines safety and standardization policies and procedures for UAS operations at Godman Army Airfield (GAAF) and within Special Use Airspace (Restricted Area 3704). It is to be used in conjunction with Army Regulations 95-23, Unmanned Aircraft System Flight Regulations, and Army Regulation 95-2, Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control (ATC), and Navigational Aids.

Applicability. This regulation applies to DOD organizational elements, activities, and agencies (military or civilian) using the Fort Knox airspace for UAS operations. This includes, but is not limited to, the Shadow Tactical Unmanned Aerial System (TUAS) and Raven Small Unmanned Aerial Vehicle (SUAV). Updates to this regulation will be written to address future systems as required. This regulation supersedes Chapter 4 (Unmanned Aircraft System Operations) of the Knox Regulation 95-1.

Proponent. The proponent of this regulation is Airfield Division, Directorate of Plans, Training, Mobilization, and Security (DPTMS). Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Airfield Division (IMSE-KNX-PLA), DPTMS, 283 Pilot Street, Suite 217, Fort Knox, Kentucky 40121-8113.

Table of Contents

Chapter 1
General

1-1. Purpose. To establish procedures and assign responsibilities governing UAS operations within Godman Army Airfield Class D Airspace and the Fort Knox training complex, Special Use Airspace (R-3704).

1-2. References. Publications and forms are explained in Appendix A.

1-3. Terms and Abbreviations. Special terms and abbreviations within this regulation are explained in Appendix E.

1-4. Responsibilities.

a. Commanders, directors, activity chiefs, and project officers/managers are responsible for ensuring personnel are properly briefed prior to the execution of a UAS missions at Fort Knox. When units are participating in training exercises or joint maneuvers, primary responsibility lies with the unit commander to promote safety and ensure proper mission coordination has been conducted. Compliance is essential to safety and continued use of Fort Knox airspace and training facilities. Non-compliance will result in curtailment of UAS operations until issues/problems are corrected. Each service, agency, and unit will operate UAS per DOD and appropriate service regulations, directives, guidelines, and manuals.

b. The AT&A officer is responsible for coordinating airspace usage with the FAA for UAS operations at Fort Knox; (502) 624-8155 (DSN 464 prefix).

c. Godman Air Traffic Control Tower is responsible for; providing control of airspace activities, enforcing established procedures, separation standards between UAS and manned aircraft while inside the Class Delta airspace, and information advisories for UAS. UAS operations may be conducted in Class D airspace provided a Certificate of Authorization (COA) has been approved by the DAR/FAA for the specific type UAS to perform the mission.

d. Fort Knox Range Branch is responsible for providing control of all UAS training maneuver areas; (502) 624-2125/2858 (DSN 464 prefix).

e. Commanders of each activity operating UAS will:

(1) Ensure UAS operations, procedures, and training are IAW Army Regulation 95-23, Unmanned Aircraft System Flight Regulations (for Army UAS) and/or appropriate service regulations, directives, guidelines, and manuals.

(2) Define the responsibilities of the UAS Mission Coordinator/PIC and delegate decision-making authority to act decisively in case of an emergency or deviation of the UAS from the programmed flight path.

(3) Ensure UAS are flown within assigned airspace boundaries (R-3704 or Godman Class D airspace) and do not deviate from approved altitudes or times of operation.

(4) Ensure Godman Airfield Operations is notified NLT 48 hours prior to the UAS flight in order to allow ample time to issue a local NOTAM with the time, date, altitude, and location of the UAS flight.

(5) Ensure the local NOTAM for scheduled UAS flight is published by Godman Airfield Operations NLT 24 hours prior to the UAS mission.

(6) Ensure each Aircraft Operator (AO) receives aviation and range briefings prior to conducting UAS operations at Fort Knox Aviation Operations (502) 624-5545, (DSN 464), Range (502) 624-1447 (DSN 464).

(7) Ensure a written UAS mission profile has been coordinated and approved before the UAS mission is flown.

(8) Develop and maintain a written Pre-Accident and Recovery Plans. The unit Pre-accident Plan should supplement and not duplicate Fort Knox Aviation Pre-Accident Plan. See FMI 3-04.155, Army Unmanned Aircraft System Operations, for additional information.

(9) Ensure a unit safety officer/NCO assists with the planning and operations of UAS missions.

(10) Develop a Composite Risk Management (CRM) Plan IAW FM 5-19, AR 95-23 (Army), or appropriate service regulation and ensure a CRM briefing is conducted for each participating AO prior to each UAS mission, including maintenance test flights.

1-5. Operations in Public Use Airspace. All UAS operations in Public Use Airspace require a Certificate of Authorization (COA) from the FAA coordinated through the Department of the Army Regional Representative (DAR) office to the FAA. Public Use Airspace is defined as airspace that is not restricted or specified for sole use.

Chapter 2
Local Flying Rules

2-1. Local Flying Area (LFA).

Airspace responsibility. Fort Knox airspace is managed by the Fort Knox Air Traffic and Airspace Officer (AT&A).

a. Fort Knox Class D airspace is controlled by Godman Tower. When Godman Tower is closed Class D airspace reverts to Class E airspace.

b. Fort Knox Class E airspace advisory services are provided by Airfield Operations (Godman Advisory) during the hours Godman Tower is closed. NOTE: Within the context of this regulation interpret Godman Tower/Advisory as; contact Godman Advisory when ATC Tower is closed.

2-2. Special Use Airspace (SUA).

a. Special Use Airspace (SUA). Restricted Area R-3704 A & B covers the range complex and is controlled, on a daily basis, by Range Branch as the "Using Agency" during range firing and training operations.

b. Louisville Tower and Indianapolis Center are the Federal Aviation Administration "Controlling Agencies" for Restricted Area R-3704 A & B, respectively.

c. UAS will not operate in Fort Knox airspace without prior coordination from Airfield Operations (502) 624-5545/6047 and Range Branch (502) 624-1447. A minimum of 48 hours advanced notice is required and the unit must have an assigned/designated area of operation approved by Range Branch. See Appendix A for UAS training areas.

2-3. SUA Coordination.

a. UAS operations within the Fort Knox SUA (R-3704 A & B) requires detailed planning and scheduling coordination with Range Branch to ensure no conflict will arise with existing airspace usage. Scheduling will be 14 or more days in advance and for a specific time period. Airspace reservations will be given on a priority basis with use of the airspace not to begin prior to or extended beyond the scheduled time period without Range Branch's approval.

b. The approval and scheduling of the Fort Knox airspace does not indicate sole occupancy of the airspace. Sole or exclusive use of these areas will be authorized only for emergencies, safety, and/or lack of compatibility of the scheduled operations with other airspace users. Requirements for sole occupancy of the airspace must be fully justified when scheduling is coordinated.

c. Commanders will review all requests to use Fort Knox airspace to ensure operational, safety, and composite risk management factors have been considered.

2-4. Restricted Area (R-3704 A & B).

a. When approved to operate within R-3704 A & B, UAS must not fly outside designated boundaries or exceed the altitude limitations approved for the flight.

b. Use of R-3704 A & B for UAS operations requires scheduling through Range Branch IAW Fort Knox Regulation 385-22, Range Safety.

c. Use of R-3704 A & B, for the purpose of UAS operations, does not restrict manned aircraft from entering R-3704 A & B; therefore, airspace coordination is a must between all parties (AO, Range Branch Firing Desk, and Airfield Division) to ensure lateral and/or vertical distance separation.

d. Parachute drops may occur in R-3704 A & B during UAS operations, however, there will be a minimum lateral clearance of 5 NMs separation from the DZ and small UAS training areas.

2-5. Operations within Godman Airfield Class D Airspace.

a. UAS flights in Class D airspace must be scheduled and coordinated with Airfield Operations. A Certificate Of Authorization (COA) must be approved for each type of UAS prior to operations within Class D airspace. Class D airspace extends from the surface to 2500 feet AGL (3300 feet MSL) and within a 5 SM (4.3 NM) radius of Godman Airfield.

b. Units will be required to operate within the limits of the Letter of Agreement (LOA) established for the Godman Airfield Class D airspace.

c. Units will be given a CD with established overlays for operation within the Class D airspace and Special Use Airspace (R-3704). Specified routes and checkpoints will be used to ensure unit personnel know established checkpoints to be used for UAS transitioning to R-3704 airspace.

d. Traffic pattern operations are not authorized for UAS within the Class D airspace.

e. Upon completion of daily operations, the using unit shall remove all equipment from the runway environment and store as follows: arresting cable/net will be de-rigged, external pilot stands and recovery net will be de-rigged (arresting gears/drums may remain in place along the edge of the runway.). Additionally, a FOD walk of the operational site will be completed. Any equipment left on the airfield which may be considered as obstruction shall be lighted with red bean bag or chemical lights.

2-6. General Safety Procedures.

a. The Mission Commander will be present during all UAS missions to monitor the effectiveness of the Composite Risk Management Plan, to include maintenance test flights.

b. Separation standards between UAS and manned aircraft will have the following altitude restrictions:

(1) Small UAS, operating in R-3704 A & B, will normally be cleared to fly at a maximum altitude of 1000 feet AGL (1800 feet MSL) unless otherwise approved by Range Branch and ATC Tower. Manned aircraft will operate no lower than 200 feet above the maximum altitude assigned to the UAS.

(2) Large UAS, operating in R-3704 A & B will normally operate at an assigned altitude between 4300 feet MSL to 9900 feet MSL. Manned aircraft will operate no lower than 500 feet above or at least 1000 feet below the assigned UAS altitude unless otherwise approved by Range Branch and ATC Tower.

2-7. Communication Procedures:

a. The UAS are flown between Godman Airfield and R3704 over primarily uninhabited or sparsely populated areas of the installation owned by the US Army. The only area outside of Restricted Airspace (R-3704) where the UAS will be operated is Godman Army Airfield, specifically on Runway 5/23 for departure/arrival (See Appendices A & B).

b. Shadow Aircraft Operators will have positive communication via a VHF or UHF radio using the local ATC frequencies with Godman Tower and via FM 38.90 with Range Branch prior to execution of the mission and a dedicated telephone back up at the launch/recovery site. Shadow UAS may not launch from the airfield to operate into R-3704 unless radio communication exists between the Aircraft Operator to Air Traffic Control Tower and Range Branch from launch to recovery. Radio communication will be established 10 minutes prior to launch and (prior to launcher pressurization) until termination of flight operations and recovery.

c. In the event that communications cannot be established, the mission will be delayed until positive communications are established. The Mission Commander assumes the responsibility for direct telephonic communications with Godman Air Traffic Control Tower at (502) 624-1717/7513 and/or Range Branch Firing Desk at (502) 624-2125 when radio communications are lost.

2-8. Lost Communication Procedures:

The PIC will maintain radio communication with Range Branch during the UAS mission while operating within R-3704 A & B and must make a communication check every 30 minutes. If radio communication with Range Branch is lost, the PIC will call Godman ATC tower at (502) 624-1717/7513 to report lost radio communication. The phone contact will be maintained, and the UAS will be recovered via the approved recovery route, altitude, and location. A lost

communications event requires immediate recovery of the UAS for landing per ATC instructions and termination of UAS operations until all communications are reestablished. Lost Communications Recovery/Holding Points; Cedar Creek and Baker, as outlined below.

2-9. Lost Link / Mission Procedures:

a. Small UAS: In the event of a lost link, the unit must notify the Range Branch Firing Desk immediately and report the location and altitude (MSL) of the pre-programmed lost link location. These aircraft should be programmed to return to their launch position at mission altitude and orbit there within the confines of their assigned UAS area until such time as the link is re-established or the aircraft runs out of fuel.

b. Large UAS: In the event of a lost link, the unit must notify the Range Branch Firing Desk and Godman Tower immediately and report last known location and which previously established lost link location is to be used. UAS should be programmed to spiral to 7100ft MSL and proceed to either Point Baker (if operating from GAAF) located at the junction of Baker Road and Wilson Road (EG 92269 99644 or 37° 56' 23.5"N 85° 57' 59.9"W) or Point Cedar (if operating from Cedar Creek Airstrip) located at the intersection of 745th Tank Battalion Way and Kelly Road (FG 03107 86117 - 37° 48' 59.96" N 85° 46' 42.74W). UAS will remain in orbit at that point in an attempt to regain the signal. In the event of lost link, operators are equipped with VHF/UHF communications, cell phone and maintain contact with Godman ATC Tower, (502) 624-1717/7513. Unit will also inform Range Branch and Godman Tower upon recovery of the UA. Position reports will be relayed upon request.

2-10. Flight Planning:

a. Flight Plans: Aircraft will not be flown unless a flight plan (DD Form 175) has been filed or an operation log completed. When DD Form 175 is used, the form will be filed according to DOD FLIP. Local commanders will establish policies specifying the flight plan or operation log to be used.

b. Weather Briefings and Current Observations are as follows:

(1) Obtain DD Form 175-1, Flight Weather Briefing, from the USAF Weather Forecaster at Godman weather station, in person at Bldg. No. 5220 or by fax to (502) 624-6165.

(2) Online at the Mission Execution Forecast link on the Fort Knox Weather Operations web page: http://www.knox.army.mil/partners/OLC18/

(3) Current observation may also be obtained by calling Fort Knox Weather Operations at (502) 624-5517/5653. NOTE: Weather observations are for Godman Airfield and may not apply to a remote field site or range areas where the conditions could be better or worse; therefore, weather forecast must be equal to or greater than VFR 1 hour prior to launch and thru mission until one hour after landing. No flight activity should occur if there is any doubt the required minimum ceiling and visibility exists.

(4) The MC for large UAS will obtain a DD Form 175-1, Flight Weather Briefing, before launch/takeoff from the USAF weather forecaster at the Godman Weather Station, (502) 624-5517/5653. If weather deteriorates below established weather minimums during the mission, the UAS will return for recovery and mission will be aborted. Godman ATC tower will exercise appropriate control to separate the UAS from other aircraft during weather-related recovery operations. The following weather restrictions apply:

(a) UAS will not be flown unless the weather forecast and existing conditions will permit flight under VFR (1000 feet AGL ceiling and 3 SMs visibility), and the following weather minimums must be met for the entire mission:

(b) At the launch and recovery site, the cloud ceiling must not be lower than 1500 feet AGL and the horizontal visibility must be at least 3 SMs.

(c) During launch, en route, and recovery, operators must be able to maintain cloud separation of 1000 feet above or below and 2000 feet horizontally and have 3 SMs flight visibility at all times.

2-11. Weather Minimums:

a. Weather minimums within R-3704A for tactical training are as follows:

(1) Where manned aircraft are participating in the mission:

b. Daylight Hours – 500 feet AGL ceiling and 1 SM visibility

c. Night Hours – 800 feet AGL ceiling and 1 ½ SM visibility

(1) Where only unmanned aircraft are conducting the mission:

a. Daylight Hours – 300 feet AGL ceiling and 1 SM visibility

b. Night Hours – 500 feet AGL ceiling and 1 SM visibility

c. Weather minimums for tactical operations within Godman Airfield Class D airspace with approved COA will be day VFR only (1,000 feet AGL and 3 SM visibilities).

2-12. Emergency Procedures. Emergency procedures are situation dependent.

a. If a mishap occurs during any phase of operation, launch to recovery, the Pilot In Command will:

(1) Perform UAS-specific mishap/emergency procedures immediately. Document the sequence of events and preserve any information or evidence.

(2) Inform Godman ATC tower and Range Branch with as much detail as possible and relay information as the situation progresses.

b. If control or link with the UAS is lost; inform Godman ATC Tower and Range Branch immediately of last known location, heading, and altitude.

c. The AO must continue attempting to regain control of the UAS and, if successful, immediately inform Godman ATC Tower and Range Branch and take appropriate actions to recover the UAS.

d. UAS with programmable guidance systems will be programmed to proceed to a designated Lost-link recovery site. NOTE: The route, altitude, and designated recovery site, which the UAS will use during Lost-link procedures, must be approved by the Briefing Officer prior to the mission.

e. Call Godman ATC Tower and Range Branch immediately if the AO determines that a UAS mishap involves injury to personnel, damage to the UAS, and/or damage to other equipment/property. Report the accident IAW Fort Knox Regulation 95-1 and 385-22 and unit Pre-accident Plan.

(1) Depending on the nature of the mishap reported by the AO, Godman ATC Tower may activate the Fort Knox Aviation Pre-Accident Plan IAW DA Pam 385-90 and Fort Knox Regulation 95-1.

(2) Fire and Emergency Services will respond IAW Fort Knox Regulation 95-1 and Fort Knox Aviation Pre-accident Plan.

(3) Outside of the restricted area the aircraft will be visually tracked by ground observers while in communication with the PIC flying the UAS. Emergency protocol requires that Godman ATC Tower be immediately notified of any abnormalities.

Chapter 3
Unmanned Aircraft System Operations

3-1. UAS Training Areas.

a. Fort Knox UAS training areas located in R-3704 A & B are designated by Range Branch. These facilities are intended for UAS launch and recovery operations; however, helicopter operations may be performed in the areas if the UAS MC has Range Branch's approval, and the flight is conducted IAW Fort Knox Regulations 95-1 and 385-22.

b. Small UAS, operating in conjunction with a live fire event on a range, are confined to the airspace immediately above the facility to the assigned altitude the unit has pre-coordinated with Range Branch to use. De-confliction of this airspace between the UAS and any live ordnance used in conjunction with the event is solely the responsibility of the unit mission planners. Use of these areas and launch/recovery points require approved coordination through DPTMS, Range Scheduling.

c. In addition to the live fire facilities, each of the training areas located within R3704 (2, 3, 4, 5, 6, 7, 16, 17, and 18 – as defined by the current edition of the Fort Knox Military Reservation Map) also defines the small UAS operating areas. One or more of these areas and launch/recovery points may be scheduled and coordinated through Range Branch DPTMS. Airspace above these small UAS areas may be scheduled from surface to 9500ft MSL.

d. The large UAS areas (19-22) roughly divide R3704 into four quadrants (NE, SE, SW, and NW respectively). Operation within the confines of the major impact areas on Fort Knox begin at 4300ft MSL and may extend to 20,000ft MSL). Specifics of all large UAS flight operations must be coordinated through Range Branch.

e. No one may enter the UAS training/launch area or runway unless cleared to do so by the UAS MC.

f. No UAS may launch from a training area unless radio communications exists between the PIC and Range Branch from launch to recovery.

g. The UAS will climb to mission altitude as quickly as possible and proceed to the mission area by the approved route, altitude, and flight plan.

h. When a UAS launch or recovery is in progress, a temporary Restricted Operation Zone (ROZ) will be activated. All manned aircraft should avoid established ROZ while it is active and will comply with altitude restrictions.

3-2. Small UAS (smaller than Shadow) Field Site Operations in SUA R-3704.

a. Use of Fort Knox training areas as small UAS launch and recovery sites, within SUA R-3704 A & B, requires coordination and scheduling with Range Branch. Multiple launches and recoveries may be performed during the approved time frames. During coordination, contact Range Branch for the most current launch/recovery procedures.

b. Small UAS will normally be cleared to fly at a maximum altitude of 1,000 feet AGL (1,800 feet MSL) unless otherwise approved by Range Branch. UAS launches and recoveries will remain in R-3704 A & B boundaries.

c. Small UAS may **not** launch from field site locations unless radio communications exist between the Range Firing Desk and the field/launch site during the duration of the mission/training. Radio communication will be established **30 minutes prior to launch** and until termination of flight operations and recovery.

d. Small UAS Operators will:

(1) Obtain current weather and forecast for the mission/training. This may be accomplished by contacting local weather facilities at Godman Airfield, (502) 624-5517/5653.

(2) Maintain radio communications with Range Firing Desk during the UAS mission and must make communication checks with Range Branch every 30 minutes or as directed. If radio communication with Range Firing Desk is lost, the AO will call Godman ATC tower at (502) 624-1717/7513 to report lost radio communication. Phone contact will be maintained and the UAS will be recovered via the approved recovery route and altitude.

e. The unit will conduct a thorough site survey prior to conducting flight operations. The survey will include, but is not limited to:

(1) Hazards which may affect the UAS operation.

(2) Suitability of area.

f. The using unit will not make any training site improvements.

3-3. Large UAS (Shadow or larger type) Field Site Operations in SUA R-3704.

a. Use of Fort Knox training areas as large UAS launch and recovery sites requires coordination and scheduling with Range Branch. Multiple launches and recoveries may be performed during the approved time frames. During coordination, contact Range Branch for the most current launch/recovery procedures.

b. Large UAS may **not** launch from a field site unless radio communication exists between the PIC and Range Branch from launch to recovery. Radio communication will be established **10 minutes prior to launch** and until termination of flight operations and recovery.

c. Large UAS operators will:

(1) File a local flight plan with Godman Airfield Operations with a current Weather Briefing, DD Form 175-1. This may be accomplished by submitting a DD Form 175, Military Flight Plan, and the Flight Weather Briefing to Base Operations in person or by FAX to (502) 624-2421. When operating from Cedar Creek Airstrip, units will maintain a flight operations log to track aircraft/missions.

(2) Operate at an assigned altitude between 3500 feet AGL (4300 feet MSL) to 10,000 feet MSL. UAS will not operate below 4300 feet MSL except during launch and recovery. UAS launches and recoveries will remain in R-3704 A & B boundaries.

(3) Maintain radio communication with Range Branch during the UAS mission and must make communication checks every 30 minutes or as directed. If radio communication with Range Branch is lost, the PIC will call Godman ATC tower at (502) 624-1717/7513 to report lost radio communication. Phone contact will be maintained and the UAS will be recovered via the approved recovery route and altitude.

(4) Ensure transponder equipped UAS have an operational transponder and set code to 4000 for operating in the SUA. Godman ATC tower can request and issue a special transponder code prior to launch if conflicts are expected. If the transponder fails to function after launch, the UAS will be recovered immediately via the approved recovery route and altitude.

d. UAS operations may be conducted in conjunction with artillery/mortar and/or close air support within R-3704 A & B, provided advanced separation coordination has been approved by Range Branch and the PIC assumes responsibility for ensuring separation from artillery/weapon firing and/or the close air support activities.

e. Receive an initial Range and airspace briefing prior to conducting UAS missions. An annual refresher briefing is required for each UAS Operator.

3-4. Multi-Platoon UAS Operations. Multiple UAS platoons may conduct training using the same launch and recovery area and SUA if the following minimum conditions are met:

a. Platoons must coordinate and agree on site location(s), frequency usage, and other standards and procedures deemed appropriate for safe operations.

b. UAS platoons will not conduct launches or recoveries within 10 minutes of the other platoon at the same site (i.e., if a platoon launches at 0800, the next platoon must wait until 0810 before launching the next UAS; this provides time separation at the launch and recovery sites).

c. UAS will maintain at least 1,000 feet horizontal and/or 500 feet vertical separation from each other during the mission.

d. Prior to conducting a climb or descent, the UAS platoon will radio the other platoon(s) to ensure designated climb/descent routes are clear.

e. Prior to conducting recoveries, the UAS platoon will radio the other platoon(s) to coordinate separate recovery operations.

3-5. Surveillance Requirements.

a. Methods of surveillance for all UAS operations (i.e., radar, visual, or manned aircraft) will be provided to the maximum extent possible. The type of surveillance will depend on the mission and type aircraft flown.

b. Information obtained from surveillance such as position, speed, altitude, and heading will be made available upon request. Where manual plotting (i.e. visual reporting as opposed to radar) of surveillance information is necessary, the time between plots must be as short as possible.

c. If at any time, the position of a UAS becomes unknown, or the UAS fails to respond to programmed "lost link" instructions, the flight will be terminated in time to preclude the possibility of impact outside the approved flight area.

3-6. Operational Planning Safety Factors.

a. Operational plans for UAS test and training flights must take into consideration the type of aircraft, results to be achieved, and the area in which operations have been approved.

b. The unit must maintain a written Airspace Safety Plan. Each Airspace Safety Plan must take the following into consideration:

(1) Capability of UAS, such as the altitude, range, speed, wind factors, and amount of guidance which may be commanded to the vehicle (programmed or other), deviations allowable from assigned headings the UAS may take due to malfunctions and type of launch.

(2) System for flight termination and recovery (i.e., parachute and/or other functions which would affect flight safety).

(3) The methods for obtaining real-time position of the UAS in flight, such as visual, manned chase airplane, radar, telemetry, etc.

(4) Aerodynamic data used to determine flight safety grids which will include, but not be limited to, glide ratio of the UAS, detailed performance data (including system time delays), location of launch site, intended recovery site, parameters of the flight area, and method of area surveillance (such as visual, manned aircraft, or radar).

Chapter 4
Recovery of Unmanned Aircraft

4-1. General.

a. This appendix is adapted from FMI 3-04.155, Unmanned Aircraft System Operations, 4 Apr 06, and outlines recovery and safety considerations for downed Army Shadow and Raven UAS. The following procedures are intended to be a major part of the UAS Pre-accident Plan, which is designed to prepare the unit for an accident/incident should one occur.

b. A Pre-accident Plan is designed to ensure that each Aircraft Operator (AO) will know what actions to take should an accident occur. Practicing the plan will ensure UAS recovery is completed in a safe and timely manner.

c. Safety risk management by all participating recovery personnel is the foremost consideration, as most UAS have one or more items that are classified hazardous materials (i.e. fuel, batteries, parts of the sensor payload, etc.,). Commanders should ensure a comprehensive recovery plan is created, documented, and trained on a regular interval.

d. A technique to aid in the recovery of any UAS is to mark the UAS with instructions for return to US Army military personnel.

4-2. Emergency Recovery Team Checklist Responsibilities.

a. Platoon Leader will accomplish the following:

(1) Ensure personnel execute the plan by producing exact guidance, appropriate checklists, and POCs.

(2) Ensure the Pre-accident Plan is distributed to all major sections (maintenance, operations, etc.).

(3) Execute notification and ensure DA Form 1594 is complete.

(4) Proceed to the operations site to oversee recovery efforts in the event of a downed UAS.

b. Mission Coordinator. Contact ATC to confirm location of downed UAS with last known location of mode 3 aircraft identification friend/foe (A/C IFF), plot crash site the crash grid map, monitor radio transmissions regarding downed UAS, and brief/update the Platoon Leader on current situation.

c. Maintenance personnel (15E) are responsible for the following:

(1) Select maintainers not involved with the flight or maintenance of the downed UAS.

(2) Collect fuel and oil samples for evaluation.

(3) Provide recovery equipment, as required.

(4) Assist in investigation as required. All related items, to include fuel and oil samples, must be secured in a locked box with an updated checklist. Leave the shelter as is with a full tank of gas and secure the door if an investigation is to be conducted.

d. Supply personnel will accomplish the following:

(1) Inventory and maintain downed UAS kit.

(2) Issue necessary Class I supply items for response and recovery team.

(3) Obtain items, as necessary, in the event of activation of this plan.

(4) All personnel with an assigned position on the downed UAS recovery crew will be familiar with assigned responsibilities and knowledgeable of investigation procedures.

4-3. Downed Aerial Vehicle Recovery.

a. If a UAS lands outside of visual range, take the following actions:

(1) Go to BLACK SCREEN—Record all necessary flight data. (The term BLACK SCREEN is defined as simultaneously pressing ENTER and PAGE to disable/enable the video signal to the applicable controller. This allows the operator to view text overlay when static is excessive.)

(2) Assemble recovery equipment and refer to tactics, techniques, and procedures manual.

(3) Plan the recovery mission.

(4) Attempt to locate UAS based on last known location.

(5) Coordinate with Range Branch for assistance/clearance into down range areas or into areas where unexploded ordnance (UXO) may be present.

b. If UAS is not located complete the following:

(1) Check for signal from UAS using remote video terminal.

(2) Conduct search based on last known location and heading.

c. Recovery and inspection.

(1) Retrieve the fuselage first (Note; keep the body away from the propeller area).

(2) Disconnect the battery from the aircraft.

(3) Gather the remainder of the aircraft components.

(4) Inspect all components for damage. Generally, minor dents or cracks do not require immediate maintenance before launching again. However, be wary of flying an aircraft with damage to the leading edge of the center wing and wingtips, the horizontal stabilizer, or the vertical stabilizer as these control flight.

4-4. Raven. The Raven UAS is designed with an auto-land feature that is initiated between 50 and 100 feet AGL and causes the UAS to descend in a deep stall. The UAS is designed so that a hard impact with the ground will allow for UAS components to separate. This is normal and helps dissipate the impact of landing and protect the UAS. A landing pad on the bottom of the fuselage also provides impact protection. The durable nature and design features of the UAS suggest the UAS is salvageable after an accident involving an un-commanded landing.

FOR THE COMMANDER:

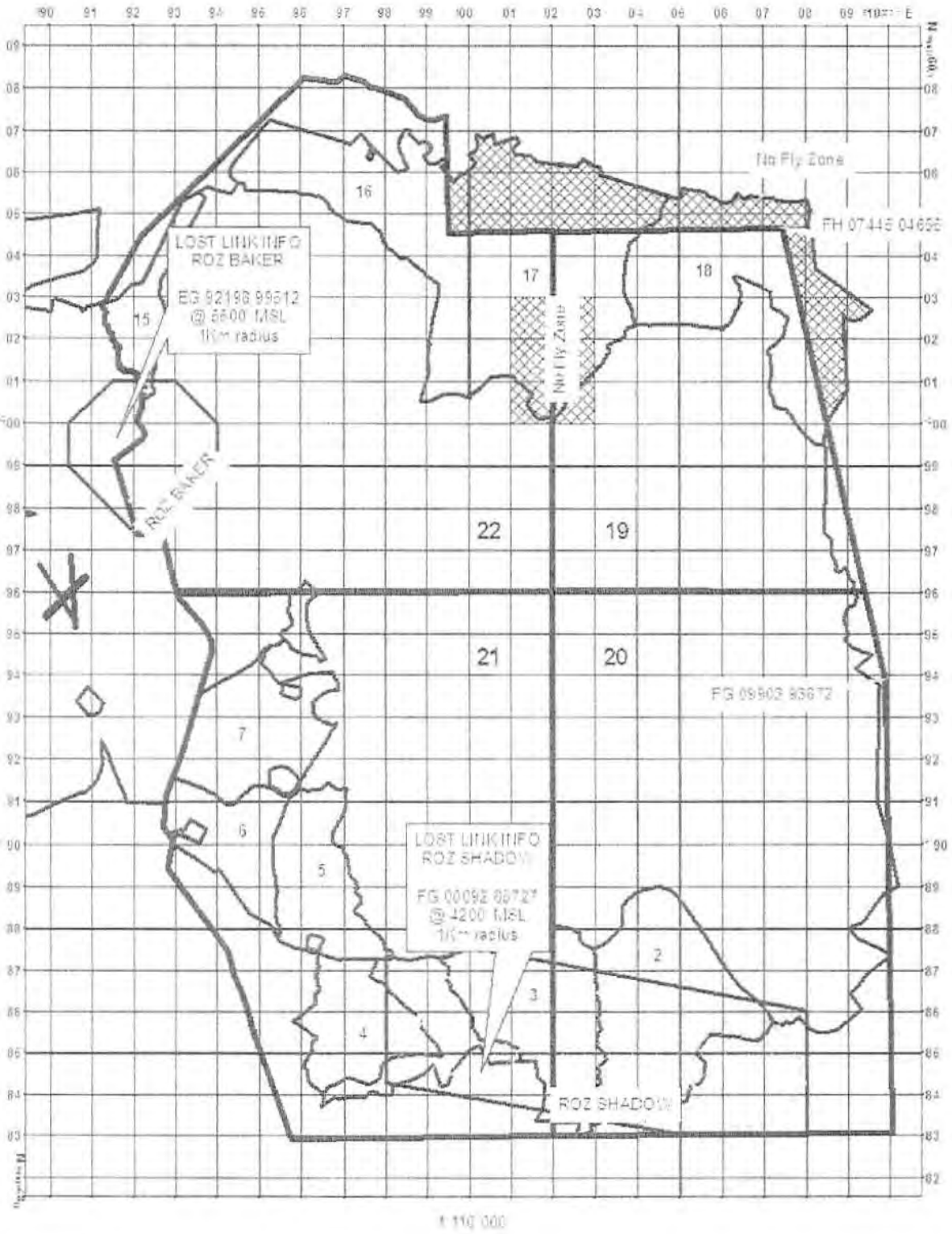
ERIC C. SCHWARTZ
COL, AR
Commanding

OFFICIAL:

MICHAEL G CARROLL
Director, Human Resources

DISTRIBUTION:
A

Appendix A


No Fly Zone
16
17
18
15
22
19
21
20
7
6
5
4
3
2
No Fly Zone
ROZ BAKER
ROZ SHADOW

Appendix B

UAS Procedure 1-A-1
Large UAS - CCAS - Launch

(i.e. RQ-7B Shadow)

Item	UAS Unit Actions	Range Branch Firing Desk Actions	
1	(NLT launch time -30 minutes) Request Permission to begin Pre-Launch Activities from CCAS.	a	Acknowledge request and grant permission.
		b	Review Airspace and NOTAM request for operating area(s) and altitude. Confirm corresponding airspace is scheduled and active.
		c	Determine what ranges/TAs/FPs (if any) are affected by the coming launch (see below*)
		d	Issue WARNO to affected units within ROZ SHADOW (BAKER) to prep for temp CF because of UAS launch.
		e	Warn all aircraft (if any) operating within R3704 of the coming UAS launch (provide UAS area and mission altitude) and direct them to depart the area of the ROZ
2	(At launch time -5 minutes or once Pre-Launch Activities are complete - as applicable) Request permission to pressurize launcher (if applicable) / or to make final preparations for launch.	a	Tell UAS unit to standby.
		b	Place affected units identified in item 1(c) into a temp CF.
		c	Confirm all other aircraft are clear of the ROZ.
		d	Make net call on RGCTRL1 & FM 38.900 that, **"ROZ SHADOW IS NOW ACTIVE." (REPEAT)**
		e	Inform GAAF of ROZ status via hot loop (Annotate 1594)
		f	Contact UAS unit and grant permission to pressurize / make final preparations and to launch when ready.
3	Launch UAS/Report successful launch	a	Acknowledge launch report (Annotate 1594)
4	Report when UAS has reached mission altitude	a	Acknowledge mission altitude report
		b	Make net call on RGCTRL1 & FM 38.900 and announce, **"ROZ SHADOW IS NOW DEACTIVATED" (REPEAT)**
		c	Inform GAAF of ROZ status via hot loop (Annotate 1594)
		d	Activate appropriate UAS tracking on board.
		e	Inform any units placed into a temp CF that they may return to live fire status

Facilities Affected by Use of This Procedure
FP 2D, E, F, G, H, I, J, K FP 3A, B, C, D, E, F, G, H, I, J TA 2,3

UAS Procedure 1-A-2
Large UAS - CCAS - Recovery

(i.e. RQ-7B Shadow)

Item	UAS Unit Actions	Range Branch Firing Desk Actions		
1	Request to commence recovery operations at CCAS.	a	Tell UAS unit to standby.	
		b	Place affected units within the ROZ into a temp CF status (if necessary).	
		c	Direct all other aircraft to exit the ROZ and report when clear	
		d	Once all are confirmed CF/clear, make net call on RGCTRL1 & FM 38.900 that **"ROZ SHADOW IS NOW ACTIVE" (REPEAT)**	
		e	Inform GAAF of ROZ status via hot loop (Annotate 1594)	
		f	Contact UAS unit and grant permission to commence recovery operations.	
2	Descend from mission altitude and land UAS (Report successful landing) and inform Warrior Ops of the next anticipated launch time or mission complete for the training day (Report total number of sorties flown).	a	Acknowledge reports. (Annotate 1594 of successful recovery)	
		b	Make net call on RGCTRL1 & FM 38.900 that **"ROZ SHADOW IS NOW DEACTIVATED" (REPEAT)**	
		c	Inform GAAF of ROZ status via hot loop (Annotate 1594)	
		d	Inform any units placed into a temp CF that they may return to live fire status	
		e	Deactivate Class B airspace (through MADE) if mission complete (if applicable).	
		f	Update tracking board	

Facilities Affected by Use of This Procedure
FP 2D, E, F, G, H, I, J, K FP 3A, B, C, D, E, F, G, H, I, J TA 2,3

UAS Procedure 1-B-1
Large UAS - GAAF - Launch

(i.e. RQ-7B Shadow)

Item	UAS Unit Actions		Godman Tower Actions	Range Firing Desk Actions	
1	(NLT launch -30 minutes) Contact Godman Tower to request permission to begin pre-launch activities.	a	Acknowledge request and inform Range Firing Desk of approximate launch time.		
		b		Review Airspace and NOTAM request for operating area(s) and altitude. Confirm corresponding airspace is scheduled and active.	
		c		Warn all aircraft (if any) operating within R3704 of the coming UAS launch (provide UAS area and mission altitude)	
2	(When pre-launch activities are complete and UAS unit is prepared to pressurize launcher) Contact Godman Tower to Request permission to pressurize launcher/ make final launch preparations	a	Contact Range Firing Desk to request authorization to launch		
		b		Once all step 1 actions are complete, authorize launch.	
		c	Contact UAS unit and grant permission to pressurize / make final preparations and launch when ready.		
3	Launch UAS/Contact Range Control Firing Desk on FM 38.900 to report successful launch	a		Acknowledge launch report (Annotate 1594)	
4	Report when UAS has reached mission altitude and enters assigned UAS area(s).	a		Acknowledge mission altitude report	
		b		Activate appropriate UAS tracking on board.	

Facilities Affected by Use of This Procedure -- NONE

UAS Procedure 1-B-2
Large UAS - GAAF - Recovery

(i.e. RQ-7B Shadow)

Item	UAS Unit Actions		Godman Tower Actions	Range Firing Desk Actions	
1	Contacts Godman Tower to request commencement of recovery operations.	a	Contact Range Firing Desk and "Request ROZ Baker"		
		b		Place Heins Range into a temp CF status (if necessary)*.	
		c		Contact Godman Tower "ROZ Baker is released to you" (Annotate 1594)	
		d	Grant permission to UAS unit to commence recovery operations.		
2	Descend from mission altitude and land UAS (Report successful landing) and inform Godman Tower/Warrior Ops of the next anticipated launch time OR mission complete for the training day (Report total number of sorties flown).	a	Report "Landing Assured" and release ROZ Baker to Range Firing Desk		
		b		Acknowledge report. Take control of ROZ Baker. (Annotate 1594)	
		c		Inform Heins Range OIC that they may return to live fire status (if applicable).	
		d		Deactivate Class B airspace (through MADE - if applicable).	
		e		Update tracking board	

Facilities Affected by Use of This Procedure
Heins QTR - Must be placed into a CF status before ROZ Baker can be made active

*Do not halt a firing order in the middle of a firing order unless there is a declared emergency.

UAS Procedure 2-A-1
Small/Medium UAS - UAS Area (No ROZ) - Launch

(i.e. RQ-11B Raven/ScanEagle/SilverFox/Puma)

Item	UAS Unit Actions	Range Branch Firing Desk Actions		
1	(NLT launch time -30 minutes) Request Permission to begin Pre-Launch Activites from _____ (specify UAS area of operation or range).	a	Acknowledge request and grant permission to begin pre-launch activities.	
		b	Review Airspace and NOTAM request for operating area(s) and altitude. Confirm corresponding airspace is scheduled and active.	
		c	Warn all aircraft (if any) operating within R3704 of the coming UAS launch (provide UAS area and mission altitude) and direct them to depart the UAS operating area(s) and report clear.	
2	(At launch time -5 minutes or once Pre-Launch Activities are complete) Request permission to make final preparations for launch.	a	Tell UAS unit to standby.	
		b	Confirm all other aircraft are clear of the UAS area(s) of operation	
		c	Contact UAS unit and grant permission to make final preparations and launch when ready.	
3	Launch UAS/Report successful launch	a	Acknowledge launch report	
4	Report when UAS has reached mission altitude	a	Acknowledge mission altitude report (Annotate 1594)	
		b	Inform GAAF of Small/Med UAS operating in UAS area(s) ___, their max altitude (Annotate 1594)	
		c	Activate appropriate UAS tracking on board.	

Facilities Affected by Use of This Procedure
NONE

UAS Procedure 2-A-2
Small/Medium UAS - UAS Area (No ROZ) - Recovery

(i.e. RQ-11B Raven/ScanEagle/SilverFox/Puma)

Item	UAS Unit Actions	Range Branch Firing Desk Actions		
1	Request to commence recovery operations	a	Acknowledge request and grant permission to commence recovery operations.	
2	Descend from mission altitude and land UAS (Report successful recovery).	a	Acknowledge recovery report (Annotate 1594)	
		b	Update UAS tracking on board.	
3	Inform Warrior Ops of the next launch time or total number of sorties flown for the training day if mission complete.	a	If mission complete for the training day, inform GAAF (Annotate 1594) UAS operations in area(s) _____ have ceased for the training day.	

Facilities Affected by Use of This Procedure
NONE

Godman ATC Procedures

UAS (SHADOW) Launch Procedures *RWY 23*		
Item	**UAS Unit Actions (Launch)**	**ATC Actions**
1	(Launch -30 minutes) Request Permission to begin Pre-Launch Activities from GAAF.	Acknowledge request and grant permission to begin pre-launch activities if able. Issue wind and altimeter.
		Notify Range Control of Pre-Launch.
2	Request permission to pressurize (Once Pre-Launch Activities are complete).	Tell UAS unit to standby.
		Check traffic conditions, to see if able to launch UAS within necessary window.
		Inform Range Control that UAS is beginning pressurization and will be departing in 5-10 minutes.
		Contact UAS unit and grant permission to pressurize.
3	(Once launcher is pressurized) Request permission to Launch.	Clear the aircraft for takeoff. Report Water Tower outbound for frequency change to Range Control. ***(Needs to be launched within 12 minutes)***
4	Launch UAS/Report successful launch. Report successful launch to Range Control.	Acknowledge launch report.
5	Report clear of Class "D" and frequency change to Range Control.	Inform aircraft holding that the UAS is clear and normal operations may resume, send requests.

UAS (SHADOW) Recovery Procedures *RWY 23*		
Item	**UAS Unit Actions (Recovery)**	**ATC Actions**
1	Contact Godman Tower of intentions to return to airfield.	Acknowledge and then alert aircraft in traffic pattern of inbound UAS.
		Inform UAS to report Point "Baker" and maintain at or above 4,200 feet. Issue wind and altimeter
		Contact Range Control for approval to "Release ROZ Baker". Expect to standby for cease fire.
2	Report arrival at Point "Baker". ***Request Runway 23*** UAS will remain at altitude until ROZ Baker released for descent	Tower will separate aircraft from the Rwy 23 traffic pattern in preparation of inbound UAS.
		Range Control will call back to release ROZ Baker to Godman.
3	Report TALS (Tactical Automated Landing System) acquisition altitude (roughly 1400' AGL).	Once aircraft have been de-conflicted instruct UAS to proceed inbound. Can issue report "Water Tower inbound" or clear to land from Point "Baker".
4	Report Water Tower Inbound	Handle as needed. (Clear to Land, Report Base etc....).
5	Once the UAS has landed.	Resume normal traffic operations.
		Notify Range Control via the Shoutline, that the UAS is arrival and "Release ROZ Baker".

UAS (SHADOW) Launch Procedures *RWY 05*		
Item	**UAS Unit Actions (Launch)**	**ATC Actions**
1	(Launch -30 minutes) Request Permission to begin Pre-Launch Activities from GAAF.	Acknowledge request and grant permission to begin pre-launch activities if able. Issue wind and altimeter.
		Notify Range Control of Pre-Launch
2	Request permission to pressurize (Once Pre-Launch Activities are complete).	Tell UAS unit to standby.
		Check traffic conditions, to see if able to launch UAS within necessary window.
		Inform Range Control that UAS is beginning pressurization and will be departing in 5-10 minutes.
		Contact UAS unit and grant permission to pressurize.
3	(Once launcher is pressurized) Request permission to Launch.	Clear the aircraft for takeoff. Report Water Tower outbound for frequency change to Range Control. ***(Needs to be launched within 12 minutes)***
4	Launch UAS/Report successful launch. Report successful launch to Range Control	Acknowledge launch report.
5	Report clear of Class "D" and frequency change to Range Control.	Inform aircraft holding that the UAS is clear and normal operations may resume, send requests.

UAS (SHADOW) Recovery Procedures *RWY 05*		
Item	**UAS Unit Actions (Recovery)**	**ATC Actions**
1	Contact Godman Tower of intentions to return to airfield.	Acknowledge and then alert aircraft in traffic pattern of inbound UAS.
		Inform UAS to report Point "Baker" and maintain at or above 4,200 feet. Issue wind and altimeter
		Contact Range Control for approval to "Release ROZ Baker". Expect to standby for cease fire.
2	Report arrival at Point "Baker". ***Request Runway 05*** UAS will remain at altitude until ROZ Baker released for descent	Tower will separate aircraft from the Rwy 23 traffic pattern in preparation of inbound UAS.
		Range Control will call back to release ROZ Baker
		Once aircraft have been de-conflicted instruct UAS to proceed inbound. Instruct UAS to report "Snow Mountain outbound" or "TALS acquisition"
3	Report TALS (Tactical Automated Landing System) acquisition altitude (roughly 1400' AGL) or "Snow Mountain outbound" (whichever comes first)	If "TALS acquisition altitude" is reported, you may either clear the UAS to land or report "Snow Mountain inbound"
		If "Snow Mountain outbound" is reported, instruct UAS to continue and report "Snow Mountain inbound" or TALS acquisition. You may then clear the UAS to land.
4	Once the UAS has landed.	Resume normal traffic operations.
		Notify Range Control via the Shoutline, that the UAS is arrival and "Release ROZ Baker".

Appendix C

Fort Knox 2008-ESA-28-COA (Shadow)

Number of Flights:	
Total Flight Hours:	
Ground Station Hours:	
Aircraft Type	
Unusual Equipment Malfunctions:	
Deviation from ATC instructions:	
Operation/Coordination Issues:	
Loss of Link:	
Proponent	

NOTE: Report due monthly to ATC Tower Supervisor for operations conducted on Godman Airfield.

Appendix D
References and Forms

AR 95-1, Flight Regulations, 12 Nov 08.

AR 95-2, Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control (ATC), and Navigational Aids, 10 Apr 07 (with RAR 001, 16 Oct 08).

AR 95-23, Unmanned Aircraft System Flight Regulations, 7 Aug 06.

Fort Knox Reg 385-22, Range Regulation (Training/Impact Areas), 1 Dec 00.

FM 5-19, Composite Risk Management, 21 Aug 06.

TC 1-600, Unmanned Aircraft Systems Commander's Guide and Aircrew Training Manual, 23 Aug 07.

TC 1-611, Small Unmanned Aircraft System Aircrew Training Manual, 2 Aug 06.

Joint Pub 3-55.1, Joint Tactics, Techniques, and Procedures for Unmanned Aerial Vehicles.

Godman Airfield Operations Manual, 13 Jun 07.

Forms:

DA Form 2028, 1 Feb 74, Recommended Changes to Publications and Blank Forms.

DD Form 175, 1 May 86, Flight Plan, Military.

DD Form 175-1, 1 Oct 02, Flight Weather Briefing.

Appendix E
Acronyms and Abbreviations

AGL	above ground level
AO	aircraft operator
AT&A	Air Traffic and Airspace Officer
ATC	air traffic control
CCAS	Cedar Creek Airstrip
CD	compact disk
COA	Certificate of Authorization
CRM	Composite Risk Management
DAR	Department of the Army Regional Representative (FAA)
DOD	Department of Defense
DPTMS	Directorate of Plans, Training, Mobilization, and Security
FAA	Federal Aviation Administration
FOD	Foreign Object Damage
GAAF	Godman Army Airfield
IAW	in accordance with
LFA	local flying area
LOA	letter of agreement
MC	mission commander
MSL	mean sea level
NCO	Non-Commissioned Officer
NLT	no later than
NM	nautical mile
NOTAM	notice to airmen
OPS	operations
PIC	pilot-in-command
POC	point of contact
ROZ	restricted operation zone
SM	statute mile
SUA	special use airspace
SUAV	small unmanned aerial vehicle
TA	training area
TALS	Tactical Automated Landing System
TUAS	Tactical Unmanned Aircraft System
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
UASTA	UAS Training Areas
UAV	unmanned aerial vehicles
USAF	United States Air Force
UXO	unexploded ordnance
VFR	visual flight rules