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**SMALL UNMANNED AIRCRAFT
SYSTEMS OPERATIONS**

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This publication implements Air Force Policy Directive (AFPD) 10-9, *Lead Command Designation and Responsibilities for Weapon Systems* and AFPD 11-5, *Small Unmanned Aircraft Systems Rules, Procedures, and Service*. It establishes requirements, responsibilities, and guidelines for operation of Air Force Small Unmanned Aircraft System (SUAS) by Air Force military and civilian personnel, personnel of other services and foreign personnel assigned or attached to USAF units, and contracted Small Unmanned Aircraft System Operators (SUAS-O) as stipulated in contracts. This publication applies to the Air Force Reserve Command (AFRC) and the Air National Guard (ANG.) Headquarters, Air Force Flight Standards Agency (FOA-AFFSA) is the Office of Primary Responsibility (OPR). This AFI may be supplemented at any level, but supplements shall be coordinated with the OPR prior to publication. MAJCOMs shall forward copies of supplements to HQ AFFSA Workflow (hqaffsa.cce@tinker.af.mil) for coordination prior to publication. Refer recommended changes, improvements and questions

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(AFMC) This supplement implements AFI11-502V3, *Small Unmanned Aircraft Systems Operations* and AFPD11-5, *Small Unmanned Aircraft Systems (SUAS) Rules, Procedures, and Service*. The purpose of this supplement is to provide AFMC guidance and procedures for use in conjunction with the basic AFI. It applies to individuals at all levels who operate Group 1, Group 2, or Group 3 SUAS within or on the behalf of AFMC, including the Air Force Reserve and Air National Guard (ANG), except where noted otherwise. Lower levels may not supplement this Supplement. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command. The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with (IAW) Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of IAW Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS).

SUMMARY OF CHANGES

This document has been substantially revised and must be thoroughly reviewed. Major changes include updates to all attachments, formatting changes, deletion of duplicative information, and deletion of placeholder chapters. The following paragraphs have been deleted as either unnecessary or moved to AFI 11-5MDS, Volume 3: **paragraph 5.3.** Proximity of Aircraft, **paragraph 5.4.** Formation Flight/Cooperative Teaming, **paragraph 5.7.** Aircraft Speed, **paragraph 5.8.** Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) Systems and Procedures, **paragraph 5.18.** Aerobatics, **paragraph 5.20.** Tobacco Use in an Air Force GCS, **paragraph 5.21.** Landing with Hot Armament, **paragraph 5.22.** Pilot Weather Reports (PIREPs), **paragraph 5.25.** Volcanic Activity, **paragraph 5.28.** SUAS Traffic Alerting and Collision Avoidance System (TCAS) Operations, **paragraph 5.29.** Terrain Awareness and Warning Systems (TAWS), **paragraph 10.4.** Working Area, **paragraph 10.7.** Wake Turbulence Avoidance, **paragraph 10.8.** Night Operations, and **paragraph 11.4.** Adverse Weather.

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Chapter 1

POLICY AND RESPONSIBILITIES

1.1. General. This instruction prescribes basic policy and guidance for operating USAF SUAS. This volume provides broad guidance and cannot address every conceivable circumstance. SUAS-Os are expected to use their best judgment in order to ensure safe conduct of SUAS operations. All operating procedures for Group 1 UAS are consolidated into AFI 11-5GP1-SUAS, AFI 11-5MDS, Volume 3 as the Group 1 Mission, Design, Series (MDS)-specific AFI. Each Group 2 and 3 UAS shall have an AFI 11-5MDS, Volume 3. Direct Reporting Units (DRUs) and the ANG are considered MAJCOMs for the purposes of this instruction. Where there is no parent group headquarters, squadrons or detachments shall assume the duties listed for groups, Numbered Air Force (NAF), MAJCOM etc.

1.1.1. Most units operating SUAS are not traditional flying squadrons; for this reason, this volume is intended to be a common source of directives applicable to SUAS operations, to include, but not limited to Air Force-specific guidance, Federal Aviation Regulations (FARs), International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs).

1.1.1. (AFMC) AFMC's test mission conducting SUAS research in controlled test environments differs significantly from AFSOC's operational SUAS mission, as well as AFMC's traditional fleet MDS test mission. Although AFSOC Lead Command 11-502 guidance serves as an overall governing rule set, AFMC's SUAS research mission in many cases necessarily requires different rule sets than operational employment and will entail numerous exceptions to the intent of 11-502 guidance. AFMC will define and comply with the SUAS requirements in this supplement and in the AFI 11-5FT series instructions IAW AFI 11-502 Volume 3, paragraph 1.12.3, "Exception: AFMC is lead command for test operations." AFMC crews will take AFI 11-5 Group-Specific guidance as informative guidance only.

1.1.2. Air Force Special Operations Command (AFSOC) is designated Lead Command for Groups 1-3 UAS (referred to as SUAS: see [Table A4.1](#)). Unmanned Aircraft (UA) of all descriptions fly in the same environment as manned aircraft. UAS operators shall follow rules and procedures, as closely aligned as fielded technology permits, to those followed by crews of manned aircraft. (T-1). Coordinating SUAS with other manned/unmanned aircraft and surface fire support/maneuver units requires detailed integration and understanding of the tactical environment.

1.1.2. (AFMC) AFMC is the lead MAJCOM for SUAS flight test operations and research. AFMC publishes a three-volume set of Flight Test (FT) instructions containing attachments for SUAS groups flown in AFMC. These instructions are numbered AFI 11-5FT Volume 1, 2, and 3 and contain the training, evaluation criteria, and operations procedures, respectively, for each SUAS group, or individually unique kinds of SUAS if applicable. AFMC uses these instructions in lieu of AFI 11-5 Group-specific volumes for SUAS flying operations. In the absence of published guidance, AFMC units will coordinate through AFRL/DO to HQ AFMC/A3V for approval of locally developed guidelines. If possible, these guidelines will be consistent with similar guidance specified in the appropriate AFI 11-5 Group-specific lead

MAJCOM Volumes, except where necessary for conduct of the AFMC SUAS test mission. In addition, SUAS on loan to AFMC undergoing short-term flight test programs will be flown according to the lead MAJCOM guidance if no AFMC guidance exists.

1.1.3. Units do not have the authority to obligate the Government to purchase, lease, procure, or contract of any new Air Force SUAS to include UA, Ground Control Station (GCS), Remote Video Terminal (RVT), Electro-Optical/Infrared (EO/IR), or any other payload prior to coordination with SAF/AQIJ. Include HQ AFSOC/A5KJ, HQ AFSOC/A3OU, and MAJCOM/A3 as information addressees. **Exceptions:** Air Force Material Command (AFMC) need not coordinate for unfielded test systems and USAFA need not coordinate for unfielded systems for the purpose of conducting research.

1.1.3. (AFMC) AFMC units must maintain an accurate inventory on file with AFRL/DO of all unit-owned SUAS. This will be integrated with the Letter of X's qualification listing to serve as a master inventory of types of vehicles and status of SUAS operator training & qualifications to fly them.

1.2. Key Definitions:

1.2.1. "Shall" indicates a mandatory requirement.

1.2.2. "Should" indicates a recommended procedure that is required, if practical.

1.2.3. "May" indicates an acceptable or suggested means of accomplishment.

1.3. SUAS Operator. An individual who has completed Initial Qualification Training (IQT) in a specific UAS and is responsible for the safe ground and flight operation of the Unmanned Aircraft (UA) and Ground Control Station (GCS). The SUAS-O shall be current and qualified in the SUAS to be operated or under the supervision of a SUAS-I. (T-1).

1.3. (AFMC) SUAS Operator. AFMC also considers any person in direct control of the SUAS such as traditional Radio Control (RC) operators and backup pilots as performing Lead SUAS-O (Pilot-In-Command equivalent) duties while in control of the SUAS, unless another Lead SUAS-O is at a similar set of override-capable controls, such as on a "buddy box." The designated Lead SUAS-O retains overall responsibility for the mission unless approved and briefed otherwise.

1.4. Lead SUAS-O. A single SUAS-O shall be specifically identified as the Lead SUAS-O by the flight authorization approving authority IAW **paragraph 4.1.** (T-1). The Lead SUAS-O, regardless of rank, is equivalent to the Pilot-in-Command (PIC) of a manned aircraft and is responsible for all aspects of the mission, regardless of crew position. A SUAS mission includes equipment preparation, planning, briefing, ground and air operations, recovery, mission debriefing, and equipment accountability.

1.5. SUAS Equipment Custodian. An equipment custodian shall be identified in writing by the Unit Commander. (T-2). The individual shall ensure SUAS equipment is secured and accounted for appropriately IAW the equipment's' level of sensitivity. (T-2). Equipment custodians shall maintain an account in the web-based Small Unmanned Aircraft Systems Manager (SUASMAN) database and keep all equipment inventory and operational status up-to-date IAW **paragraph 11.2.** (T-2). Individuals shall be trained prior to conducting field-level repairs on SUAS equipment. (T-2).

1.5. (AFMC) SUAS Equipment Custodian. The unit commander (AFRL Technical Director or USAF TPS Commandant) shall designate a SUAS Equipment Custodian.

1.6. Compliance.

1.6.1. Units operating SUAS shall comply with the following: (T-1)

1.6.1.1. MAJCOM guidance. (T-2).

1.6.1.2. AFI 11-5MDS instructions and supplements. (T-2).

1.6.1.3. Federal Aviation Regulations (FARs) applicable to SUAS when operating within the United States to include the airspace overlying the waters out to 12 miles from the US coast, unless the FAA has excluded military operations. (T-0).

1.6.1.4. International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs) applicable to SUAS in international airspace over the high seas, military mission permitting. (T-2).

1.6.1.5. The specific rules of each individual nation as published in Flight Information Publications (FLIP) Area Planning (AP) and General Planning (GP) documents and the Foreign Clearance Guide (FCG). Theater commanders shall ensure the content of FLIP accurately convey the rules of each nation within their area of responsibility when different from this instruction. (T-2).

1.6.1.6. ICAO SARPs when operating in a nation whose rules are not published. (T-2).

1.6.1.7. Procedures and special notices in FLIP, Notice to Airmen (NOTAM), aircraft technical orders/operator's manual, and Air Traffic Control (ATC) instructions. (T-2).

1.6.1.8. Contractor requirement to comply with Air Force UAS guidance must be stipulated in contracts. (T-1).

1.6.1.9. UAS leased or loaned to Air Force organizations shall be operated in compliance with Air Force guidance. (T-1).

1.6.2. MAJCOM Supplements. MAJCOM/DRU supplements shall not be less restrictive than this instruction. MAJCOM supplements to this instruction must be coordinated with HQ AFFSA prior to publication IAW AFD 11-5, *Small Unmanned Aircraft Systems (SUAS) Rules, Procedures, and Service*. MAJCOMs shall forward copies of supplements to AFFSA, HQ AFFSA/A30 and HQ AFFSA/A3FV for coordination prior to publication at hqaffsa.a3of@tinker.af.mil.

1.7. FAA Advisory Circulars (AC) and Technical Standard Orders (TSOs): IAW AFI 63-137, *Assurance of Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM), Navigation Safety, and Next Generation Air Transportation System (NEXTGEN) Performance*, system performance and software development processes for non-civil type certificated aircraft must either satisfy civil standards or provide an equivalent level of safety and performance. FAA Advisory Circulars (ACs) and Technical Standard Orders (TSOs) provide civil standards for the Certification and Operational Approval of navigation safety systems.

1.8. Waiver Authority. IAW AFI 33-360, *Publications and Forms Management*. Waivers to the basic guidance in this instruction shall be requested through applicable operations channels to MAJCOM/A3, or equivalent level. (T-1). HQ AFFSA/CC is designated as the Approving

Official to concur with renewal of existing waivers. MAJCOM/A3s shall forward an info copy to HQ AFFSA/A3O and HQ AFSOC/A3V. Waivers to supplemental guidance shall be handled by the MAJCOM agency that generated the supplement. Unless otherwise specified in AFI 11-5MDS, Volume 3, MAJCOM/A3s are the waiver authority for specific individual SUAS crewmember operations requirements. Waivers to this instruction shall not exceed 12 months. (T-1). Units assigned, attached, or under operational control of a combatant commander shall request waivers through the Commander, Air Force Forces (COMAFFOR) who may approve, disapprove, or forward to HQ AFFSA/A3O for action. (T-2). **Exception:** During combat operations and tactical field training exercises, group commanders may waive the provisions of paragraphs 7.3 and 7.4 for Group 1 UAS operations.

1.8.1. HQ AFFSA shall be notified when:

1.8.1.1. Compliance with this instruction creates a hazard.

1.8.1.2. An essential MAJCOM requirement makes a waiver necessary.

1.8.2. MAJCOMs. MAJCOMs may authorize a waiver to this instruction without prior approval from HQ AFFSA, if doing so is essential to the defense of the United States because of a military emergency or an urgent military necessity. MAJCOM designated representatives shall notify HQ AFFSA within 72 hours of authorizing a waiver at hqaffsa.a3of@tinker.af.mil or DSN 339-9783. Unless otherwise specified in appropriate AFI 11-5MDS, Volume 3, MAJCOM/A3 is waiver authority for operational procedures. Delegation of waiver authority is at MAJCOM discretion.

1.8.3. Waiver Process. Units requiring a waiver shall follow the procedure listed below: (T-1)

1.8.3.1. Units shall forward their request for a waiver to this instruction through their chain of command to their MAJCOM/A3. (T-1). The unit shall include a detailed package supporting the request (T-1).

1.8.3.1. (AFMC) AFRL is the lead AFMC organization for AFMC SUAS operations. Waivers to the basic guidance outlined in the AFI and this supplement will be routed through appropriate training channels to AFRL/DO prior to submission to HQ AFMC/A3V for coordination. Submit waiver requests on an AFMC Form 73, *AFMC Flight Operations Waiver Request*. HQ AFMC/A3V will forward requests for waivers to basic guidance to the appropriate agency for action.

1.8.3.2. MAJCOM/A3 shall review the request. If approved, MAJCOM/A3 shall endorse the request and forward info copy to HQ AFFSA/A3O and HQ AFSOC/A3V.

1.8.3.3. MAJCOMs shall track the currency of all approved waivers to ensure waiver renewals are requested a minimum of 30 days prior to the expiration date. HQ AFFSA shall review and respond in writing to MAJCOM waiver requests.

1.8.3.4. Approved waivers shall include an expiration date.

1.8.4. (Added-AFMC) Tier requirements refer to waiver authority based on level of risk.

1.8.4.1. (Added-AFMC) "Tier 0" (T-0) requirements are reserved for requirements that non-compliance is determined and waived by respective non-Air Force authority.

1.8.4.2. **(Added-AFMC)** “Tier 1” **(T-1)** requirements are reserved for requirements that non-compliance may put airman, mission, or program strongly at risk, and may only be waived by the MAJCOM/CC or delegate with concurrence of publication approver. When multiple MAJCOMs are affected, then T-1 is appropriate.

1.8.4.3. **(Added-AFMC)** “Tier 2” **(T-2)** requirements are reserved for requirements that potentially put the mission at risk or potentially degrade the mission or program, and may only be waived by the MAJCOM/CC or delegate.

1.8.4.4. **(Added-AFMC)** “Tier 3” **(T-3)** requirements are reserved for requirements that non-compliance has a remote risk of mission failure, and may be waived by the Wing/CC but no lower than the OG/CC.

1.8. (AFMC) Waiver Authority. HQ AFMC/A3V is waiver authority for this supplement. AFMC units conducting SUAS operations (AFRL Technical Directorates, and USAFTPS) may supplement only AFI 11-5FT Volume 3, *SUAS Flight Test Operations Procedures*, to incorporate additional unit-specific SUAS flight test operational requirements. Send unit supplements to AFI 11-5FT-series instructions to AFRL/DO who will forward to HQ AFMC/A3V for review and approval.

1.9. FAR Exemptions and Authorizations. MAJCOMs shall obtain FAA exemptions only through HQ AFFSA.

1.9.1. MAJCOM commanders may unilaterally authorize deviation from air traffic rules if it is considered essential to the defense of the United States and there is insufficient time to follow normal procedures. MAJCOMs shall notify HQ AFFSA as soon as practical.

1.9.2. An ATC clearance is not authority to deviate from this instruction.

1.10. Deviations: SUAS-Os may deviate from any flight rule when an in-flight emergency requires immediate action, to protect lives, for safety of flight. **Note:** Consideration of hazards created must be factored into a decision to deviate. Preservation of the UA is not paramount.

1.10.1. Notification. When deviating from an ATC clearance, the SUAS-O shall notify ATC of the action taken as soon as possible. (T-2).

1.10.2. Post-Flight Actions. The following post-flight actions shall be taken in the event of a deviation from a flight rule and/or when given traffic priority by ATC in an emergency:

1.10.2.1. The SUAS-O shall notify the immediate supervisor and commander within 24 hours of the incident and shall make a detailed written record. (T-2).

1.10.2.2. The unit shall keep a copy of that record for a minimum of 1 year from the date of the incident and provide that record to the appropriate investigating authority, if requested. (T-2).

1.10.2.3. Minor deviations from assigned airspace or mission profiles that do not qualify for formal reporting and do not result in a Hazardous Air Traffic Report (HATR) are to be reported using the format in Attachment 2. Complete all information except the individual’s name/unit and submit to HQ AFSOC/A3OU for trend analysis purposes. **Exception:** AFMC is lead command for test operations.

1.10.2.3. **(AFMC)** Submit reports of minor deviations through unit Safety channels to AFRL/DO for review and submission to AFMC/A3V for trend analysis purposes. **(T-3).**

1.11. Violations. A violation may result when an Air Force SUAS deviates from flight rules. FAA ATC facility deviation reports involving an Air Force SUAS are processed IAW AFI 13201, *Air Force Airspace Management*. Air Force air traffic control facility deviation reports involving Air Force SUAS are processed IAW AFI 91-202, *The US Air Force Mishap Prevention Program*. Violations that occur in the airspace of foreign nations are handled IAW the procedures of that nation.

1.11.1. The names of the operators shall not be released to non-USAF agencies without the permission of the Air Force Representative to the FAA (AFREP), in coordination with MAJCOM/A3s or HQ USAF/A3O.

1.12. Dimensional Units. Visibility distances are in statute miles (SM). All other distances referred to in this instruction are in nautical miles (NM) unless otherwise identified.

1.13. SUAS-O Medical Requirements.

1.13.1. Active duty and Government employee SUAS-Os require initial, and thereafter annual, medical clearance documenting compliance with SUAS medical standards found in AFI 48-123. This clearance shall be obtained from a medical provider located at an AF military treatment facility (MTF). Contractor SUAS-Os require a current FAA Second Class medical certificate. Members who do not meet medical standards shall not perform SUAS operations unless granted a medical waiver.

1.13.2. SUAS-Os shall not use any over-the-counter medication which would likely result in a decrease in alertness or otherwise negatively impact SUAS operations.

1.13.3. SUAS-Os shall clear any prescription medication use with the appropriate medical authority, either the FAA medical examiner or the MTF provider as appropriate.

1.13.4. SUAS-Os shall report any new medical conditions which could negatively impact SUAS operations to the appropriate medical authority, either the FAA medical examiner or the MTF provider as appropriate.

Chapter 2

PREFLIGHT REQUIREMENTS

2.1. Preflight Planning.

2.1.1. SUAS-Os shall accomplish preflight planning. (T-2). Operators shall acquaint themselves with all information, procedures and rules appropriate to the SUAS and the mission. (T-2). This shall include:

2.1.1.1. Appropriate sections of the aircraft Technical Order (T.O.), Operator's Manual or equivalent manufacturers' publications and MAJCOM mission-specific guidance (e.g. FCIF and SIIs). (T-2).

2.1.1.2. All relevant information, to include NOTAM and GPS NOTAMs, found at <https://www.notams.jcs.mil>. When operating in deployed locations, contact the Space Duty Officer at the AOC for current GPS and SATCOM performance, interference, and jamming information. (T-2).

2.1.1.3. Flight Information Publications (FLIP) appropriate to the specific SUAS and mission, including appropriate sectional aeronautical charts or Portable Flight Planning System (PFPS)/Falcon View with FAA/ICAO airspace and/or display of approved working area boundaries (whichever is more restrictive). (T-2).

2.1.1.3. (AFMC) Charts or ground station displays shall depict pertinent mission groundtracks and restrictions such as airspace and working area containment boundaries (e.g., Caution and Kill zones), avoidance areas, terrain/obstacle hazards, launch/recovery areas, approach zones, and programmed waypoints (including lost command link waypoints, orbits, routings, and approaches). The charts or displays will have all the necessary information to safely accomplish normal and emergency mission elements. (T-3).

2.1.1.4. Alternatives available if the flight cannot be completed as planned. (T-2).

2.1.1.4. (AFMC) ASRR, SDPs, and Jeppesen Military Chart Services are not applicable to AFMC SUAS operations. SUAS operations at any airfield/location require specific pre-coordination and authorization with each particular airfield/range operating agency. Airfields other than those inside Restricted or Warning areas require COA coordination through AFMC/A3O. SUAS-Os and other test team members must ensure they are familiar with the unique operating requirements coordinated for each operating location.

2.1.1.5. Departure, en route, destination, and alternate weather observations and forecasts. (T2).

2.1.1.6. Maximum operating altitudes, minimum safe altitudes, visual line-of-sight, and data link line-of-sight considerations for the planned route of flight and area of operations. (T2).

2.1.1.7. Loss-of-Link procedures coordinated through ATC and Range Control agencies. (T-2).

2.1.1.7. (AFMC) In no case shall lost link programming or procedures allow a SUAS to come within 500' of personnel or property. Exception: 100' for Group 1 SUAS.

2.1.1.7.1. (Added-AFMC) Lost link procedures with an indefinite conclusion to the flight (e.g. simply orbiting until command link is regained) will presume that the SUAS could remain in its lost link mode until fuel/power exhaustion, and plan procedures accordingly to ensure safety. Definite conclusions include programmed flight termination or landing; either promptly after the lost link event, or upon independent/global timeout (i.e., total sortie time, actual time of day, etc.) set well before fuel/power exhaustion.

2.1.1.7.2. (Added-AFMC) Proper initial SUAS response to lost command link programming will be verified during preflight checks. The remainder of lost link programming/parameters shall be verified by two people.

2.1.1.8. Takeoff/launch and landing/recovery limitations. Unless stated otherwise in a system's Operator Manual, all references to wind limits apply to surface winds and not winds aloft. (T-2).

2.1.1.9. AFI 11-5MDS, Volume 3, (T-2).

2.1.1.9. (AFMC) AFMC uses AFI 11-5FT Volume 1, 2, and 3 instructions in lieu of AFI 11-5 Group-specific volumes for SUAS flying operations.

2.1.1.10. Applicable airfield advisories, bird advisories and hazard information, available through Automated Terminal Information System (ATIS), Internet sources, or as disseminated locally. (T-2).

2.1.1.10. (AFMC) SUAS operators will review the AHAS/BAM website (<http://www.usahas.com/>) during mission planning for all missions to the max extent practical. SUAS operators will review the AHAS/BAM forecasts for all TDY locations prior to departure from home field, and then at TDY locations to the maximum extent practical. The risk levels presented are standardized and may not necessarily impact the specific SUAS or mission. The Risk and BASH link at the AHAS/BAM site will be consulted for more information on AHAS/BAM risk-level assignment. Document bird hazard risk assessment and mitigations (if AHAS/BAM risk is other than LOW) on the SUAS ORM worksheet. Some preflight risk management tools that may be employed by SUAS operators during mission planning include selecting another operating time, location, routes, or altitudes to where AHAS/BAM indicates a lower threat; and avoiding flight near food sources (for example, water and landfills). Exception: The requirement of this paragraph is waived when the SUAS is flown within an area of 1000' radius by 100' altitude from the SUAS Operator.

2.1.1.10.1. (Added-AFMC) SUAS operators/observers that encounter a bird hazard will take or direct evasive action, and as soon as practical broadcast (on the appropriate frequency) to the test team the location, altitude, and intensity of the avian hazard. Operators will also inform the applicable controlling agency/ATC if appropriate, about encountered bird hazards.

2.1.1.11. Operational Environment Assessment. An assessment as to the operational viability which may or may not be based on one or more factors (e.g., intel, weather, legal, Command and Control (C2), terrain, SA). (T-2).

2.1.2. Due Regard. In international airspace, when operationally necessary, SUAS-Os are authorized to conduct military flight operations with due regard for the safety of navigation of civil traffic IAW FLIP GP "Operations and Firings over the High Seas." Due Regard operations may be conducted under the following restrictions:

2.1.2.1. In Visual Meteorological Conditions (VMC); or

2.1.2.2. Within radar surveillance and under positive communication control of a surface or airborne radar; or

2.1.2.3. Outside the limits of controlled airspace.

2.2. Fuel/Battery Charge Requirements.

2.2.1. General Information. The SUAS-O shall ensure sufficient fuel/battery charge is available on board the aircraft to safely conduct the flight. (T-2). Before takeoff the aircraft shall have enough usable fuel/battery charge aboard to complete the flight to a final landing, either at the destination airport or landing zone or the alternate airport (if one is required and authorized), plus the fuel reserves. (T-2). (**Exception:** Group 1 SUAS; land the UA before reaching minimum useable battery capacity.)

2.2.1. (AFMC) Refer to AFI 11-5FT Volume 3 for additional fuel/power requirements if required. In all cases, comply with fuel/battery requirements in AFI 11-502, Volume 3, paragraph 2.2.

2.2.2. Fuel Reserve. The SUAS-O shall ensure the aircraft is carrying enough usable fuel on each flight to increase the total planned flight time by 10 percent or 20 minutes, whichever is greater. (T-2). To compute fuel reserves for reciprocating engine-driven aircraft and helicopters, use fuel consumption rates for normal cruising altitudes.

2.2.3. Declaration of Minimum or Emergency Fuel. When operating in FAA controlled airspace, SUAS operators shall declare minimum or emergency fuel to the controlling agency when in their judgment the aircraft may land at the intended destination with less than the required emergency fuel reserve. (T-2).

2.3. Weather.

2.3.1. SUAS-Os shall obtain sufficient weather information to safely conduct the flight. (T-2). The following weather sources are authorized:

2.3.1.1. Home/Local Installation OSS Weather Flight (or equivalent)

2.3.1.2. Regional Operational Weather Squadron (OWS) **Note:** Contact information for the servicing OWS and/or installation weather flight is located in Section C of the IFH).

2.3.1.3. Other DOD Military Weather Sources (e.g. US Navy/US Marine Corp weather facilities).

2.3.1.4. Other published MAJCOM-approved weather sources.

2.3.1.5. Other US Government (USG) Weather Facilities/Services (i.e. National Weather Service, FAA).

2.3.1.6. Foreign Civil Weather Service (Use only when DOD military resources or USG services are unavailable in OCONUS locations).

2.3.2. Group 1 SUAS-Os are exempt from the weather briefing requirements of **paragraph 2.3.1** Group 1 SUAS-Os must have reasonable cause to believe that the local weather conditions will permit successful employment and operations will be in compliance with applicable range directives, operations orders, FAA, or other governing directives.

2.3.3. Weather Considerations. All SUAS mission planning requires careful attention to weather and its effects on the UA during flight operations; particular attention should be paid to temperature, winds, precipitation, and hazardous weather phenomena. These factors include, but are not limited to:

2.3.3.1. Wind effects on launch, navigation legs, loiter, and landing. Operators must keep in mind small unmanned aircraft avionics may be more sensitive to turbulence.

2.3.3.2. Wind effects on acoustic signature of the UA at the target.

2.3.3.3. Effects of thermals on altitude, station-keeping and image stability.

2.3.3.4. Restrictions to visibility (fog, smoke, haze, precipitation, sun angle) and effects on observation of the UA and UA sensor capability.

2.3.3.5. Timing and effects of thermal crossover on sensor ability.

2.3.3.6. Temperature extremes and its effects on aircraft, payloads, and batteries.

2.3.3.7. Effects of high humidity on internal and external payloads (sensors).

2.3.3.8. Effects of precipitation on payloads, batteries, and electronics.

2.4. Briefings.

2.4.1. The lead SUAS-O shall ensure each crewmember is briefed on items affecting safety or mission completion. These briefings shall include, but need not be limited to: (T-2)

2.4.1.1. Emergency procedures.

2.4.1.2. Airspace/operating area, approved frequencies and method of complying with restrictions.

2.4.1.3. Safety precautions and restrictions, including use of electronic devices. (see **paragraph 2.5.**)

2.4.1.4. Special procedures and instructions for use during training or operational missions.

2.4.2. Briefing Guides. MAJCOMs shall address the use of briefing guides in the MAJCOM supplement to this instruction.

2.4.2. (AFMC) AFRL/DO may create standardized briefing guides for SUAS units. In the absence of AFRL/DO guides, units may develop their own briefing guides IAW 11-502, Volume 3, paragraph 2.4.

2.4.3. Briefing Times. Start briefings in sufficient time to complete the briefing prior to flight operations.

2.4.4. Mission Brief. All crewmembers scheduled to fly the mission shall receive a mission briefing prior to assuming any crew position.

2.4.4.1. Brief an alternate mission for each flight (if applicable).

2.4.4.2. Mission elements and events may be modified and briefed while the UA is airborne as long as changes do not compromise flight safety. Do not fly non-briefed missions and/or events. The Lead SUAS-O shall ensure all crewmembers acknowledge all changes.

2.4.5. Mission Debrief. After changeover or landing, debrief all aspects of the mission.

2.5. Electronic Devices. The Lead SUAS-O shall prohibit the use of any device suspected of creating interference with any part of the system. (T-1). These devices shall be turned off from the time the aircraft is readied for launch or leaves its parking spot for departure until recovered or parked after landing. (T-1). SUAS-Os shall mitigate any risks associated with Electromagnetic Interference (EMI) from other devices by moving required devices a sufficient distance to prevent EMI, turning the device off, or moving the Ground Control Station (GCS). (T-1). For the purposes of this instruction, “electronic devices” are any electronic devices not electrically interfaced with existing SUAS equipment.

2.5.1. Authorized Portable Non-transmitting Devices. The following devices that do not transmit a signal through an antenna may be used at any time: hearing aids, heart pacemakers, non-transmitting watches, hand-held calculators, electric shavers, and equipment certified IAW paragraph 2.5.2. Personal camera use is prohibited during single operator missions.

2.5.2. Testing Requirements. Devices that are not authorized for flight in the above paragraphs must be tested in accordance with MIL-STD-461F, “*Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment*,” to determine their suitability for use in flight. Technical guidance, advice on testing capabilities, and assessment of test results are the responsibility of ASC/ENAD, 2530 Loop Road West, Wright Patterson AFB (WPAFB) OH 45433-7101, DSN 785-8928 or 785-2860.

2.6. Foreign Object Damage (FOD) Hazards. MAJCOMs shall provide guidance for SUAS-Os to ensure the wearing of jewelry (or other personal accoutrements) in, or around, the GCS and at the launch and recovery area do not create a FOD hazard.

2.6. (AFMC) Foreign Object Damage (FOD) Hazards. Personnel will not wear lanyards, scarves, wigs, hairpieces, ornaments, or earrings while performing duties around the SUAS, fueling equipment, launch/recovery equipment, the pilot controller, or ground station. Long hair must be contained to eliminate entanglement hazards; barrettes, pins, clips, and other hair fasteners may be used only for this purpose. Other loose or potentially loose items will be properly secured and accounted for to minimize foreign object damage (FOD) risk. Lead SUAS-Os will ensure that spectators, observers and other personnel wearing these items do not create a FOD hazard.

2.7. Equipment Required for Flight. SUAS typically incorporate self-stabilizing subsystems. All equipment necessary for automatic flight is required for operations. **Note:** The minimum

required displays for emergency manual recovery are: airspeed, altitude, heading, and last known position.

2.7.1. Flight Instrumentation. Primary flight instrumentation must provide full-time display of attitude, altitude, and airspeed information and the capability to recognize, confirm, and recover from unusual attitudes. Information should be positioned and arranged in a manner enabling an effective crosscheck.

2.7.1.1. The following flight instrumentation (if equipped) shall always be displayed (and illuminated during night operations): (T-2).

2.7.1.1.1. Climb/Dive Angle (or pitch and vertical velocity).

2.7.1.1.2. Bank Angle.

2.7.1.1.3. Barometric Altitude.

2.7.1.1.4. Indicated or Calibrated Airspeed.

2.7.1.1.5. Prominent Horizon Reference.

2.7.1.1.6. Heading.

2.7.1.1.7. Fault indications to include loss of link.

2.7.1.2. Electronic Flight Displays. Many modern instrument displays allow the SUAS-O to optimize GCS instrumentation for a particular mission by de-cluttering, removing or relocating presentations. In some cases, a SUAS-O can omit elements necessary for basic attitude awareness and aircraft control. Attitude awareness and the requirements listed in [paragraph 2.7.1](#) shall always be displayed. (T-2).

2.8. Global Positioning System (GPS) Considerations (If Applicable). A GPS Notice Advisory to NAVSTAR Users (NANU) is an advisory message to inform users of a change in the GPS constellation. These messages are released 72 hours in advance for planned maintenance. These messages are also used to notify users of unscheduled outages. General NANUs can be used to disseminate general GPS information. For beyond line of sight UAs and those with the ability to manually deselect satellites, NANUs shall be checked if intending to operate a GPS-reliant unmanned system. A source is: <http://celestrak.com/GPS/NANU/>.

2.8.1. Operators shall attempt to verify satellite availability prior to using GPS as the basis of flight operations. Satellites that shall become unavailable during the flight should be manually deselected, if possible. (T-2).

2.8.2. A GPS predictive tool can be found at <http://augur.ecacnav.com/>. This resource should not be used to replace NANUs, but as a preliminary mission planning tool or in the event Notice Advisory to NAVSTAR Users (NANU) are unavailable in the operational area.

2.8.3. Units shall develop procedures to disseminate information about GPS reliability to operators in the field. (T-2).

2.8.4. **(Added-AFMC)** GPS-reliant systems. AFMC SUAS shall be considered GPS-reliant subject to preflight requirements if either [paragraphs 2.8.4.1](#) or [2.8.4.2](#) apply:

2.8.4.1. **(Added-AFMC)** If the SUAS is programmed to execute flight termination in the event of loss of GPS, or both GPS and communication. Test teams must consider the

loss-of-GPS programming modes available, and expect that systems may on occasion experience otherwise routine, temporary lost command link at the same time. If programmed in this manner, this situation would cause the SUAS to self-terminate controlled flight, causing loss of the vehicle and payload, OR:

2.8.4.2. **(Added-AFMC)** No command link with ability to control navigation manually is maintained throughout the mission, AND either of the following apply:

2.8.4.2.1. **(Added-AFMC)** GPS is the sole navigation source (there is no other backup navigation source aboard the SUAS used by the autopilot to be able to continue with degraded navigation to normal waypoints if GPS is lost, such as sustained dead-reckoning (DR) calculations, inertial/IMU, etc.), OR

2.8.4.2.2. **(Added-AFMC)** GPS-level precision is essential to successful completion of the mission (i.e. precise target impact or recovery/landing coordinates are critical)

2.9. SUAS Hand-off Procedures. Detailed procedures for hand-off of airborne UAs between ground control stations shall be included in each SUAS operator's manual or established in local operating procedures. (T-2). These are the minimum items that shall be accomplished prior to launch of the UA: (T-2).

2.9.1. Select time and location for hand-off.

2.9.2. Select a safe recovery area for the UA.

2.9.3. Identify a method to confirm positive transfer of control between operators, i.e., voice, UA maneuvering, etc.

2.9.4. Brief all participants on the contingency plan for unsuccessful UA hand-off.

2.9.5. Identify and confirm specific equipment settings, required at each GCS, for hand-off.

Chapter 3

AIRSPACE & FREQUENCY COORDINATION PROCESS: FLIGHT PLANS AND FAA CERTIFICATES OF WAIVER OR AUTHORIZATION (COA)

3.1. General. SUAS operations are conducted only in authorized airspace. SUAS operating characteristics and systems capabilities, mission requirements, and SUAS Crew qualifications drive specific airspace requests. Without a certified “Sense and Avoid” capability, separation from other aircraft is accomplished by mitigating measures such as segregated operating areas, altitude blocks, or external observers. For SUAS operations in the National Airspace System (NAS) outside of Warning and Restricted areas refer to **paragraph 3.4**. Operations conducted within Restricted or Warning Areas (or within a theater of operations under combat airspace control measures) require only coordination between responsible organizations. SUAS-Os shall be appropriately qualified (or directly supervised by an instructor) in order to conduct operations within the class of airspace authorized for operations.

3.2. Flight Plans. There is no file and fly provision for SUAS. This paragraph is reserved for future development.

3.3. Airspace. Airspace managers may resolve an airspace conflict by the use of time separation, altitude separation, lateral separation, relocation of one of the airspace users, elimination of one of the users, or by concurrence of the approving authorities (range, airspace, and participating units) to accept the assessed risk of simultaneous operations. SUAS-Os and mission planners shall use the procedures in **paragraphs 3.4 – 3.6** to facilitate the coordination/deconfliction process. SUAS-Os shall comply with the following: (T-2)

3.3.1. FAA Documents (e.g. FAAN JO 7110.512.). **Note:** FAA Advisory Circular 91-57, *Model Aircraft Operating Standards*, does not apply to the operations of SUAS intended for military use.

3.3.2. DOD-FAA Memorandums of Agreement (MOA).

3.3.3. ICAO regulations.

3.3.4. Host country rules, regulations, and laws.

3.3.5. Military regulations (e.g. AFI 13-204, *Functional Management of Airfield Operations*).

3.3.6. DOD FLIP (e.g. General Planning Guide, Area Planning Guides).

3.3.7. Local flight regulations and procedures (e.g., Base Flying Regulations).

3.3.8. SUAS operator’s manuals and checklists.

3.3.9. Frequency Deconfliction directives (contact MAJCOM/A6 Frequency Manager and Base/Range Frequency Manager).

3.3.10. Description of operating area or a depiction, showing agreed working area boundaries/limits. Consider identifying a buffer zone to prevent exceeding cleared limits.

3.3.11. **(Added-AFMC)** Prior to operating out of a new operating location, a site survey will be conducted to review field layout, points of intended landing, surrounding terrain and obstacles (close & distant), airspace requirements, and any local unique procedures.

3.4. CONUS National Airspace System (NAS) Operations.

3.4.1. Units shall coordinate use of airspace within the National Airspace System (NAS) IAW this chapter and FAA directives. (T-1). SUAS operations may be conducted outside of restricted airspace and warning areas only with FAA authorization in the form of an FAA COA or notification IAW FAA/DOD guidance/agreements. Units shall contact HQ AFSOC/A3OU through their appropriate MAJCOM to obtain assistance with a COA or the FAA notification for operations in some Class D and G airspaces. (T-1). **(Exception:** AFMC/A3O shall process all COAs for AFMC RDT&E missions). (T-1). For planning purposes, a unit submitting a COA should anticipate a minimum of 70 business days prior to flight operations. For Class G notifications, HQ AFSOC/A3OU requires a minimum of three business days prior to operations. Units requesting FAA approval to operate SUAS shall follow the guidance below: (T-1).

3.4.1. **(AFMC) SUAS Operations within the NAS.** If Certificates of Authorization (COA) will not meet mission requirements due to the characteristics of the SUAS, submit waiver requests through AFRL/DO to HQ AFMC/A3V for staffing to AFMC/A3O.

3.4.1.1. AF units shall request authorization/approval for SUAS operations outside of restricted airspace or warning areas through their appropriate MAJCOM POC.

3.4.1.2. If approved, the MAJCOM shall forward the request to HQ AFSOC/A3OU via email to AFSOC.A3OU.WF@us.af.mil. If the request is disapproved, the MAJCOM shall notify the unit and provide the rationale for disapproval.

3.4.1.3. Upon receipt of MAJCOM approval, HQ AFSOC/A3OU shall issue a COA on-line account to the unit (without commit authority). A COA on-line account is required for both COAs and for Class G notifications IAW the current DOD/FAA MOA.

3.4.1.4. Units requesting the COA or a Class G notification shall input the information into the FAA COA on-line system and notify HQ AFSOC/A3OU via email to AFSOC.A3OU.WF@us.af.mil that the COA application or Class G notification information is complete.

3.4.1.5. HQ AFSOC/A3OU shall review the COA application and/or Class G notification for accuracy to include, but not limited to:

3.4.1.5.1. Airworthiness statement.

3.4.1.5.2. Medical qualifications (both observers and operators).

3.4.1.5.3. Training qualifications (both observers and operators).

3.4.1.5.4. System and operational information.

3.4.1.6. Once the COA application and/or Class G notification is complete, HQ AFSOC/A3OU shall commit the COA/Class G notification to the FAA and shall notify the unit and the MAJCOM with the COA case number or Class G notification number. HQ AFSOC/A3OU shall continuously track the COA application status and shall update units and MAJCOM as needed.

3.4.1.7. HQ AFSOC/A3OU shall notify AF/A3O-BA of the COA details (who, what, where, when, etc.) and/or Class G notifications via email within 1-day of committing the COA or notification to the FAA.

3.4.1.8. The FAA COA process normally takes 60 business days for new COA applications and 30 business days for renewals. HQ AFSOC/A3OU, working through AF/A3O-BA, shall coordinate/ recommend solutions to unit based on FAA feedback, questions, or concerns. AF/A3O-BA shall engage with the FAA to resolve any COA issues.

3.4.2. Units requesting UAS operations in the NAS shall coordinate with the appropriate frequency manager for authorization to use SUAS communication frequencies (e.g., control and data links, WIFI, LMR, etc.). (T-1).

3.4.3. Units shall remain in communication with the specified controlling agency at all times during operations as well as an independent means of backup communications available from the ground control element to the controlling agency. (T-1).

3.4.4. If operations spill out of the assigned airspace or a Loss-of-Link (LOL) condition occurs and the UA does not return to the designated return home point, contact the controlling agency as soon as possible and provide the following information to the controlling agency: (T-2).

3.4.4.1. SUAS type/size.

3.4.4.2. Last known location and time of LOL.

3.4.4.3. Heading, altitude, airspeed.

3.4.4.4. Estimated flight time remaining.

3.4.5. Contact controlling agency if mission is cancelled or terminated early. (T-2).

3.4.6. Airspace restrictions for the National Airspace System (NAS). The FAA defines the NAS as a common network of United States airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material. Included are system components shared jointly with the military. There are two types of airspace within the NAS, controlled and uncontrolled.

3.4.6.1. Uncontrolled Airspace. The portion of airspace that air traffic control has neither the authority nor the responsibility for exercising control over air traffic.

3.4.6.2. Controlled Airspace. Airspace of defined dimensions which air traffic control service is provided to IFR flights and to VFR flights in accordance with airspace classification. Controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E airspace. Listed below is a brief description and depiction of each class of airspace. For more details refer to the DOD Flight Information Publication, *General Planning (GP)*.

3.4.6.2.1. Class A. Generally, that airspace from 18,000 feet MSL up to and including FL600, including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons shall operate their aircraft under IFR. (T-0).

3.4.6.2.2. Class B. Generally, that airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger

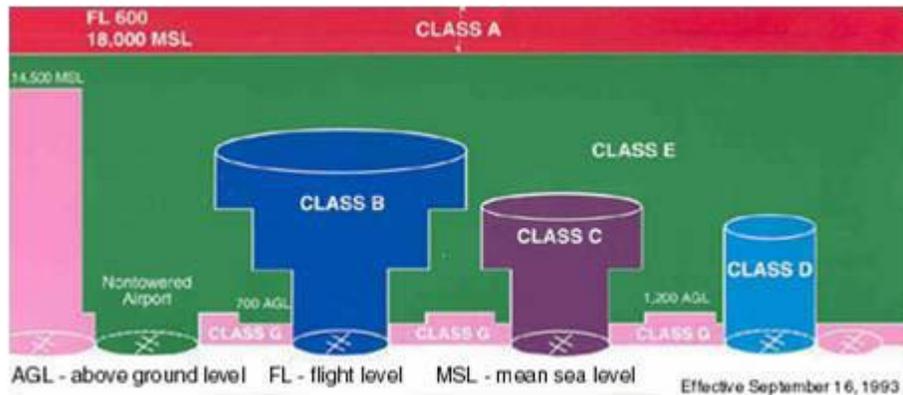
handling. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.

3.4.6.2.3. Class C. Generally that airspace from the surface to 4,000 feet above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger handling. The airspace usually consists of a surface area with a 5 NM radius, and an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Each person shall establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. (T-0). VFR aircraft are only separated from IFR aircraft within the airspace.

3.4.6.2.4. Class D. Generally, that airspace from the surface to 2,500 feet above the airport elevation surrounding those airports that have an operational control tower. Unless otherwise authorized, each person shall establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. (T-0). No separation services are provided to VFR aircraft. SUAS operations in Class D airspace require a COA or other FAA approval. (T-0). Additional guidance in AFI 13-204, paragraph 5.8 states procedures for local SUAS operations shall be published in the Base Airfield Operations Instruction, and any other appropriate lines operating procedures (LOP). (T-1).

3.4.6.2.5. Class E. Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or enroute environment, enroute domestic, and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Class E airspace does not include the airspace 18,000 MSL or above.

3.4.6.2.6. Class G. (uncontrolled airspace). That airspace not designated as Class A, B, C, D, or E.

Figure 3.1. Controlled Airspace.

3.4.6.2.7. **Restricted Area.** Restricted areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants.

3.4.6.2.8. **Warning Area.** A warning area is airspace of defined dimensions, extending from three nautical miles outward from the coast of the U.S. that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning areas is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.

3.4.6.2.9. **(Added-AFMC)** Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated.

3.5. Coordination Procedures for OCONUS Host Nation Airspace. Refer to specific host nation agreements and International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). MAJCOMs are responsible for specifying airspace and frequency request procedures.

3.6. Coordination Procedures for Combat Zone and other Contingency Operations. Refer to Joint Publication 3-52, *Joint Doctrine for Airspace Control in the Combat Zone*, and theater air operations directives.

Chapter 4

FLIGHT AUTHORIZATION, APPROVAL, AND CLEARANCE AUTHORITY

4.1. Flight Authorization. USAF SUAS flights shall be authorized by the unit commander or the first commander in the operational chain of command. (T-2). Mission validity, SUAS-O qualifications and training status, planning, and risk mitigation shall be considered before authorization. Approving officer shall initial the ORM worksheet and flight authorization (**Attachment 3**). (T-2). **Exception:** AFMC shall develop a tailored Operational Risk Management (ORM) Checklist and shall define the ORM program requirements for test operations. (T-1). **Note:** To ensure the noncombatant status of civilians and contractors is not jeopardized, commanders shall consult with their servicing judge advocate office for guidance before using civilian or contractor personnel in combat operations or other missions involving direct participation in hostilities.

4.1.1. (**Added-AFMC**) Visitors may not operate a set of flight controls on any SUAS, except for VIP demonstration flights under the supervision of a SUAS-I at a second set of flight controls. The SUAS-I must perform all maneuvers during critical phases of flight, emergencies, and test plan execution. Units will notify AFRL/DO of any VIP demonstration flights. (**T-3**).

4.1. (AFMC) Flight Authorization. Operational Risk Management (ORM) Worksheets. All AFMC units operating SUAS will use the AFRL/DO SUAS ORM assessment worksheet to identify and manage risks associated with their flying mission. Units may define and tailor elements IAW 11-502, Volume 3, **Chapter 10**, and after approval from AFRL/DO. Worksheet data for all flights will be tracked and reviewed periodically by the unit Lead SUAS-I and Chief of Safety, and results reported to the applicable FOA.

4.2. Additional Approval and Requirements. MAJCOMs may prescribe which Air Force aircraft can file to or land at Continental United States (CONUS) civil (P) airports. MAJCOMs shall approve each airfield from which SUAS may operate.

4.2.1. (**Added-AFMC**) AFMC SUAS flights are only authorized under an approved test or training plan. Authorizations are governed by AFMC test plan approval processes and AFI 11-5FT series instructions.

4.2.2. (**Added-AFMC**) Airfields other than those inside Restricted or Warning areas require COA coordination through AFMC/A3O.

4.2. (AFMC) Additional Approval and Requirements. A list of designated local area operating locations will be submitted by the Unit Commander to AFRL/DO for review and submission to AFMC/A3V for approval. This listing will include procedures published in test plans, unit local area procedures instruction, or unit supplement to AFI 11-5FT Volume 3. A local area designated operating location is defined as an area (civil, military, or joint use) routinely available to or used by a unit for SUAS flight operations where airspace coordination has been completed IAW host range/base procedures and airfield status is known and routinely monitored by the unit operations supervision or host base/range. Locally coordinated procedures may not be used to grant relief from any guidance contained in an AFI or AFMC supplement.

4.3. ATC Clearances and Instructions.

4.3.1. The SUAS-O shall ensure compliance with ATC clearances or instructions unless: (T-1).

4.3.1.1. An amended clearance is obtained.

4.3.1.2. An emergency exists.

4.3.1.3. Deviation is required in response to a Traffic Alert and Collision Avoidance System (TCAS) advisory.

4.3.1.4. Deviation is necessary to ensure safety of flight.

4.3.2. If the SUAS-O is unsure of the ATC clearance he or she should immediately clarify it with ATC.

Chapter 5

GENERAL FLIGHT RULES

5.1. Operational Standards.

5.1.1. Reckless Flying. The SUAS-O is responsible for ensuring the aircraft is not operated in a careless or reckless manner that could endanger life or property. SUAS shall not be used to conduct flights for personal use. (T-1).

5.1.2. Off-Station Training. The SUAS-O shall ensure the execution of all off-station training activities are unit commander-approved, flown to achieve valid training requirements, present a positive image of the Air Force and does not present an image of waste and/or abuse of government resources. (T-1).

5.1.2. (AFMC) For flights originating and terminating away from home base, the Unit Commander will establish SUAS operations reporting procedures to ensure monitoring of local and TDY SUAS, crew status, location, and mission status.

5.1.3. Unauthorized SUAS Flight Demonstrations. Unauthorized or impromptu SUAS flight demonstrations, maneuvers, or “fly-bys” are prohibited. AFI 11-209, *Aerial Event Policy and Procedures*, addresses authorized flight demonstrations.

5.1.4. SUAS-Os at their Stations. Operators shall occupy their assigned duty stations during flight operations, unless absence is normal in the performance of crew duties, or in connection with physiological needs. (T-1). SUAS-Os shall not leave their duty station unless another qualified SUAS-O is in the ground control station and the new SUAS-O acknowledges control of the aircraft. (T-1).

5.1.5. (Added-AFMC) Squadron Supervisors will monitor unit flying operations in accordance with AFMCI 11-201. If impractical, SUAS units (or Operations Group) will comply with the intent of AFMCI 11-201 by outlining unit procedures for supervision of SUAS flying. Units (or Operations Group) will submit these procedures through AFRL/DO for coordination and approval by AFMC/A3V.

5.2. See and Avoid. SUAS-Os operating in VMC, whether or not under radar control, are responsible to see and avoid other traffic, terrain, obstacles and also maintain VFR cloud clearance. For SUAS operations to comply with see and avoid requirements, they shall have the capability to see (or detect) traffic and clouds in sufficient time to perform an avoidance maneuver in a timely manner. (T-1). This can be done through the use of dedicated surface or airborne observers (chase vehicle) in direct communication with operators. If not capable of see and avoid, SUAS may only be operated in approved segregated airspace (Restricted or Warning Areas, Restricted Operating Zones, etc.). In this case, VFR weather minimums may not apply. MAJCOMs shall determine SUAS weather limit requirements based on aircraft equipment, level of autonomy and crew qualification. SUAS-Os shall not allow the aircraft to be flown so close to another that it creates a collision hazard. (T-1).

5.2.1. Compliance. SUAS operations that do not comply with [paragraph 5.2](#) shall be conducted under specific arrangements with appropriate aviation authorities (FAA, host nation, or military control). (T-0). FAA COAs issued IAW FAA Order (FAAO) Joint Order (J.O.) 7610.4 Chapter 12, Section 9 or arrangements with host-nation aviation authorities do

not waive the FARs nor provide relief from ICAO Rules of the Air. FAAO 7610.4, Chapter 12, Section 9, outlines an equivalent level of safety comparable to see and avoid requirements for manned aircraft. SUAS operations in compliance with a FAA COA are acceptable because they incorporate an equivalent level of safety agreed to by the FAA. SUAS operations in compliance with host nation aviation authorization are acceptable provided they incorporate an equivalent level of safety addressing as a minimum the measures outlined in FAAO J.O. 7610.4, Chapter 12, Section 9. SUAS operations in Special Use Airspace (SUA) are acceptable provided equivalent level of safety measures are in place with controlling agencies and other airspace users.

5.2.2. Operations in the NAS. ATC only provides separation between IFR and VFR aircraft operating within Class B and C airspace. In Class D and E airspace, ATC provides traffic advisories on VFR aircraft on a time-permitting basis. Standard IFR separation is provided to all aircraft operating under IFR in controlled airspace. Outside the NAS the crew should consult ICAO and country specific guidance outlined in the FCG and FLIP.

5.2. (AFMC) See and Avoid. AFMC SUAS weather limitations are described in **Chapter 6** of this supplement.

5.3. Right-of-Way Rules. Usually, right-of-way is given to the aircraft least able to maneuver, which normally permits that aircraft to maintain course and speed. However, visibility permitting, each pilot shall take whatever action is necessary to avoid collision, regardless of who has the right-of-way. (T-0). When another aircraft has the right-of-way, the yielding aircraft shall not pass over, under, abeam, or ahead of the other aircraft until well clear. (T-0). **Note:** Due to the size and paint scheme, a small UA may not be easily seen by other aircraft. Therefore, the SUAS operator shall always be prepared to take evasive action to include flight termination and potential destruction of the aircraft. (T-1).

5.3.1. Distress. Any aircraft (manned or unmanned) in distress has the right-of-way over all other air traffic. Manned aircraft in distress have the right-of-way over SUAS in distress.

5.3.2. Converging. When converging at approximately the same altitude (except head-on or approximately so), the aircraft to the other's right has the right-of-way. Aircraft of different categories have the right-of-way in the following order of priority:

5.3.2.1. Balloons.

5.3.2.2. Gliders.

5.3.2.3. Aircraft towing or refueling other aircraft.

5.3.2.4. Airships.

5.3.2.5. Rotary or fixed-wing aircraft.

5.3.3. Approaching Head-On. If aircraft are approaching each other head-on or approximately so, each shall alter course to the right. (T-0).

5.3.4. Overtaking Aircraft. An overtaken aircraft has the right-of-way. The overtaking aircraft shall alter course to the right. (T-0).

5.3.5. Landing. An aircraft established on final approach has the right-of-way over other aircraft on the ground or in the air, except when two or more aircraft are approaching to land.

In this case, the aircraft at the lower altitude has the right-of-way if it does not use this advantage to cut in front of or overtake the other.

5.3. (AFMC) Right-of-Way Rules. AFMC SUAS operations shall operate under the presumption that all other aircraft have right-of-way over SUAS, unless specifically coordinated otherwise real-time with ATC or the other aircraft's operator.

5.4. Communication in Flight.

5.4.1. Communication with ATC. SUAS-Os shall establish and maintain two-way radio communications with the proper ATC facility or FSS IAW the procedures appropriate for the class of airspace as outlined in FLIP. (T-0). Coordinate alternate communications methods with the appropriate ATC facility prior to commencing operations. (T-1). For SUAS operations in controlled airspace, two-way radio shall be the primary means of communications. (T-0). Maintain contact with the range or special use airspace controlling agency. (T-2). Notify the controlling agency if the mission is cancelled or terminated early. (T-2).

5.4.2. Emergency Frequencies. Monitor emergency frequencies at all times (unless the radio equipment does not have this capability). (T-1).

5.4.3. ATC Communications Failure. Follow the communications failure procedures published in the Flight Information Handbook (FIH). (T-0). For SUAS operations there shall be an independent means of backup communications available from the ground control element to the ATC agency controlling the aircraft. (T-1).

5.5. Airport Operations.

5.5.1. Takeoff and Landing.

5.5.1.1. Clearances. Obtain a clearance from ATC before taxiing, taxiing onto a runway, takeoff (or launch), or landing (or recovery), at an airport with an operating control tower. (T-1).

5.5.1.2. Uncontrolled Field Procedures. At uncontrolled fields:

5.5.1.2.1. Use the runway favored by the winds if no other factors make that runway unacceptable. (T-1).

5.5.1.2.2. Announce your activities on the appropriate frequency. (Refer to the Aeronautical Information Manual (AIM) and AFMAN 11-217, Volume 1, *Instrument Flight Procedures*, for more detail.) (T-1).

5.5.2. Turns after Takeoff, Low Approaches, or Closed Patterns.

5.5.2.1. Do not turn after a takeoff, touch and go or low approach until at least 400 ft. above the departure end of the runway (DER) elevation, at a safe airspeed, and past the end of the runway (if visible) unless: (T-1)

5.5.2.1.1. Specifically cleared by the controlling agency.

5.5.2.1.2. Safety dictates otherwise.

5.5.2.1.3. Required by local or published departure procedures. **Note:** The 400 ft. restriction does not apply when executing a closed pattern.

5.5.3. Traffic Pattern Procedures.

5.5.3.1. At Air Force installations, fly the traffic pattern published in the local flying procedures publication or FLIP, unless otherwise directed. (T-1).

5.5.3.2. At other than Air Force installations, fly traffic patterns as directed by the control tower or published in FLIP, FAR Part 91 Subpart B, or the AIM. (T-0).

5.5.3.3. At airports with no control tower, follow the standard light signals or visual indicators that prescribe the direction of traffic and landing runway. Departures shall comply with the appropriate route for the airport. (T-0). (Refer to AIM for detailed information.)

5.5.4. SUAS Launch/Landing Areas. SUAS may operate from/to other than established landing areas (i.e., fields, highways, parks, etc.) if a military requirement exists and the user receives appropriate clearances (Range Operations, FAA COA, etc.). To use the area for landing, implement safeguards to permit operations without hazard to persons or property.

5.5.4. (AFMC) All AFMC SUAS with other than conventional rolling takeoff and landing methods (launcher, belly skid/net recovery, skyhook) are authorized operations from other than established landing surfaces under an approved test or training plan. Authorizations are governed by AFMC test plan approval processes and AFI 11-5FT Volume 3.

5.5.5. Night Runway Operations. The SUAS-O shall adhere to the following guidance during night operations from prepared surfaces (T-1):

5.5.5.1. SUAS shall not be operated from a runway or other prepared surface unless the takeoff and landing area is outlined with operating lights and is clearly discernible. (T-1). Covert runway markings may be used by qualified crews using suitable sensors or night vision devices.

5.5.6. Landing Gear Reporting Procedures. SUAS-Os operating retractable gear aircraft must report "gear down" to the ATC agency or runway supervisory unit after extending the landing gear. (T-0). This report shall be made during any approach to an airport prior to crossing the runway threshold. (T-0).

5.6. Altitude Requirements. Consider GCS Line of Sight (LOS) to the UA when selecting minimum operating altitudes. If an approved FAA COA is required for operation, comply with the provisions of the COA. (T-0). If a COA is not required, except for takeoff or landing, do not operate UAs:

5.6.1. Emergency Landing. Below an altitude that, should an emergency landing become necessary, creates undue hazard to persons or property. (T-1).

5.6.2. VFR. Under VFR above 3,000 ft. AGL at altitudes or flight levels other than those specified in FLIP. In airspace under FAA jurisdiction, these altitudes do not apply when turning or holding in a holding pattern of 2 minutes or less. (T-1).

5.6.3. Congested Areas. Over congested areas (i.e., cities, towns, settlements) or groups of people if the altitude does not ensure at least 1,000 ft. above the highest obstacle within a 2,000-ft. radius of the aircraft. **Exception:** SUAS-O operating Group 1 SUAS in the US NAS or operating IAW host nation agreements may operate at lower altitudes and in closer proximity if they do not create a hazard to persons or property on the surface. (T-1).

5.6.4. Non-congested Areas. Over non-congested areas at an altitude of less than 500 feet AGL except over open water, or in special use airspace, or in sparsely populated areas. Under such exceptions, SUAS-O shall not operate aircraft closer than 500 ft. to any non-participating person, vessel, vehicle, or structure. **Exception:** SUAS-O operating Group 1 SUAS may operate at lower altitudes and in closer proximity if they do not create a hazard to persons or property on the surface. (T-1).

5.6.5. Flight over National Recreation Areas and Wildlife Refuges. Mission permitting, not less than 2,000 ft. AGL over the following areas: national parks, monuments, seashores, lake shores, recreation areas, and scenic river ways administered by the National Park Service; national wildlife refuges, big game refuges, game ranges, and wildlife refuges administered by the US Fish and Wildlife Service; and wilderness and primitive areas administered by the US Forest Service. This paragraph is not applicable to special use airspace, low-altitude tactical navigation areas, and MTRs. Higher altitudes may exist for specific areas. (See AP/1B and sectional aeronautical charts.) **Exception:** SUAS-O operating Group 1 SUAS may operate at lower altitudes and in closer proximity if they do not create a hazard to persons or property on the surface and when prior coordination and approval has been accomplished. **Note:** Operations over these areas shall typically require a COA. (T-1).

5.6. (AFMC) Altitude Requirements. SUAS-O operating Group 1 SUAS may, if directed by test requirements and approved by the safety review process, operate no closer than 100' to exposed persons or property on the surface (with the exception of operations required for launch and recovery) without a waiver to this supplement. SUAS-Os must ensure planned altitudes provide obstacle and terrain hazard clearance along the transit route.

5.7. Disaster Areas. SUAS-O shall not operate their aircraft within a designated disaster area. (T-1). NOTAMs list disaster areas. Exceptions are permitted when an aircraft is:

5.7.1. Tasked to aid in airborne relief for the area.

5.7.2. Approved to operate from an airport or operating zone in the area.

5.7.3. On a flight that has been specifically cleared by ATC.

5.8. Altimeter Settings. If equipped, set altimeters according to FLIP General Planning and Area Planning documents. In combat zones, comply with guidance in airspace control plan and ATO SPINS. (T-2).

5.9. Simulated Emergency Flight Procedures.

5.9.1. Restrictions. See AFI 11-5MDS, Volume 3.

5.9.2. Required MAJCOM Guidance. MAJCOMs shall publish guidance for practicing simulated emergency takeoffs, approaches, and landings.

5.9.2. (AFMC) Guidance for practicing emergency procedures is contained in AFI 11-5FT Volume 3 and the Group-specific attachments. FOAs may approve exceptions only when required as part of an approved test plan.

5.10. Touch-and-Go Landings.

5.10.1. Touch-and-go landings are authorized if required by course syllabus or continuation training requirements.

5.10.2. MAJCOMs may authorize touch-and-go landings in any command-operated SUAS.

5.10.3. MAJCOMs shall provide explicit guidance in its command supplement about operating conditions and operator qualifications.

5.10.3. (AFMC) Touch-and-go landings are authorized in any AFMC SUAS provided all requirements of AFI 11-5FT Volume 3 and AFI 11-5FT Volume 1 are met.

5.11. Dropping Objects.

5.11.1. Restrictions. The SUAS-O shall not allow the dropping of objects from the aircraft except (T-2):

5.11.1.1. In an emergency.

5.11.1.2. When mission requirements dictate as specified in the MAJCOM supplement to AFI 11-5MDS, Volume 3.

5.11.2. MAJCOM Responsibilities. MAJCOMs shall establish procedures to ensure airdrops comply with applicable directives.

5.11.2. (AFMC) All SUAS airdrops will be conducted under approved test plans or locally developed procedures.

5.12. Aircraft Lighting (if equipped).

5.12.1. Reduced Lighting. MAJCOMs may authorize reduced or light-out operations in restricted areas, warning areas or host nation approved areas in a MAJCOM supplement to this instruction. Host nation approved areas may be documented in a LOA or host nation regulatory documentation.

5.12.1. (AFMC) Overt lighting is only required outside Restricted and Warning areas. Reduced or lights-out operations within Restricted and Warning areas are authorized for AFMC SUAS when test requirements dictate, under an approved test plan, and fully coordinated with the airspace owning agency. If a test requirement exists to operate outside of Restricted or Warning areas with reduced lighting, units must coordinate requests through the applicable FAA COA procedures.

5.12.2. Position Lights. Aircraft equipped with position lights shall display them between the hours of official sunset and sunrise (T-2):

5.12.2.1. Immediately before engine start and when an engine is running. Aircraft that do not have power available before start shall turn them on as soon as power is available.

5.12.2.2. When parked in an area likely to create a hazard or while being towed, unless clearly illuminated by an outside source.

5.12.3. Anti-collision and Strobe Lights. Anti-collision lights and strobe lights are not the same. For the purposes of this section, anti-collision lights are the primary flashing light system on the aircraft intended to attract the attention of others to enhance see and avoid operations, while strobe lights are systems such as wingtip strobes or other similar strobe light installations.

5.12.3.1. Ground Operations. Aircraft equipped with anti-collision lights shall display these lights IAW AFI 11-218, *Aircraft Operations and Movement on the Ground*. (T-2).

5.12.3.2. Airborne Operations. Aircraft equipped with anti-collision and strobe lights shall operate these lights as follows (T-2):

5.12.3.2.1. Anti-collision lights must be on from takeoff to landing.

5.12.3.2.2. Strobe lights shall be operated IAW MAJCOM or aircraft T.O. guidance.

5.12.3.3. The SUAS-O may turn off anti-collision lights when it is in the best interest of safety to do so.

5.12.3.4. The SUAS-O may continue the mission with the failure of any light of the anti-collision light system to the first stop where repairs can be made.

5.12.4. Landing Lights.

5.12.4.1. When mission requirements dictate, use of landing lights (if equipped) is optional during take-off/ landing, if the aircraft is equipped with an operational sensor that provides a visual representation of the runway environment. Operations shall comply with **paragraph 5.6.5.1.** (T-2).

5.13. Participating in Aerial Events. SUAS-Os shall ensure compliance with AFI 11-209, when participating in aerial events, demonstrations, and static displays. Group/CC shall approve any flight operations. (T-3).

5.14. Adverse Weather.

5.14.1. Weather Conditions. Maintain situational awareness of weather conditions and trends. (T-2). Avoid turbulence that exceeds operating handbook limitations and be prepared to change altitudes or course to mitigate turbulence and escape headwinds that may prevent recovery. (T2). Avoid flight into precipitation that exceeds operating limitations. (T-2). Be aware of icing levels and follow operating handbook procedures for escaping or mitigating icing. Be vigilant of inflight visibility, not only because of limitations to mission accomplishment and successful recovery but also because of the difficulty imposed on any required observers or manned aircraft in seeing and maintaining visual contact with the aircraft. SUAS-Os shall immediately report hazardous weather conditions to their controlling agency. (T-2).

5.14.2. Operations in the Vicinity of Thunderstorms. The SUAS-O shall not intentionally operate into a thunderstorm. (T-2). When observed or reported thunderstorm activity adversely affects the planned flight route, SUAS-Os shall delay the scheduled mission or alter the route of flight within approved airspace to avoid the thunderstorm activity. (T-2). SUAS-Os shall use all available information including surface radar, PMSV, and PIREPs to avoid thunderstorm activity. (T-2). **Note:** Induced lightning strikes and electrostatic discharges can occur in what may look like benign conditions; a thunderstorm does not have to be present for these discharges. See AFH 11-203, Volume 1, *Weather for Aircrews*, for detailed information on thunderstorms, lightning, and electrostatic discharge. SUAS operators shall not takeoff, land, or fly an approach where thunderstorms are producing hail, strong winds, gust fronts, heavy rain, lightning, wind shear, microbursts, or other hazardous conditions. (T-2).

5.14.2. (AFMC) Missions requiring planned penetration of a thunderstorm require HQ AFMC/A3 approval. See AFI 11-5FT Volume 3 for additional MAJCOM thunderstorm guidance.

5.14.3. Takeoff with Ice or Frost. The SUAS-O shall not takeoff (or launch) with ice, snow, or frost adhering to the wings, control surfaces, propellers, engine inlets, or other critical surfaces of the aircraft. (T-1).

5.15. Wake Turbulence and Wind Shear. SUAS-Os operating UAS Group 2 or 3 shall: (T2).

5.15.1. Report Wake Turbulence. Notify ATC when encountering wake turbulence on any approach or landing (T-2).

5.15.1. (AFMC) When authorized to operate in conjunction with other aircraft, SUAS-Os must be familiar with and observe at least the wake turbulence avoidance criteria in AFMAN 11-217, Volume 3, Supplemental Flight Information, and FLIP. Operators must keep in mind that SUAS will be much more susceptible to wake turbulence, depending on the size and type of other aircraft, and will adjust accordingly for additional margin. Immediately report a wake turbulence encounter to the controlling agency.

5.15.2. Report Wind Shear. Immediately report a wind shear or microburst encounter on takeoff, approach, or landing to the most appropriate agency (e.g., control tower, approach control, PMSV) and, if possible, include (T-2):

5.15.2.1. Altitude of the encounter.

5.15.2.2. Loss or gain in airspeed or altitude.

5.15.2.3. Type of aircraft.

5.15.2.4. Location of occurrence (see AFH 11-203, Volume 1).

5.16. Night Vision Goggles (NVG) Operations. MAJCOMs shall address the use of NVGs during SUAS operations in the MAJCOM supplement to this instruction.

5.16. (AFMC) Operations and training requirements for SUAS NVG operations are specified in AFI 11-5FT, Volumes 1 and 3.

5.17. Imagery and Sensor Operations. When observing targets outside of government-controlled property, comply with AFI 14-104, paragraph 9.6 “Air Force units with weapon system video and tactical ISR capabilities may collect imagery during formal and continuation training missions as long as the collected imagery is not for the purpose of obtaining information about specific US persons or private property.” SUAS-Os shall ensure imagery and ISR collection assets are utilized for valid mission requirements. (T-1). Regardless of Operations Area, SUAS ISR shall present a positive image/lawful purpose for the USAF and the USA. (T1). SUAS-Os and SOs shall not transfer mission collected ISR to personal devices or distribute to non-authorized sources. (T-1).

Chapter 6

FLIGHT RULES

6.1. Visual Flight Rules (VFR).

6.1.1. Operational Air Force SUAS shall fly under VFR. (T-2). Fielded SUAS and SUAS-Os have neither the equipment nor training and certifications required to comply with procedures for operation under Instrument Flight Rules (IFR). Until a certified sense-and-avoid capability is fielded, SUAS require dedicated observers in order to assure separation from other aircraft and clearance from clouds. Normally, SUAS flights are conducted using procedural airspace control in some form of segregated airspace. When operating outside of Restricted Airspace and Warning Areas, one or more dedicated observers must be employed and the SUAS-O/Observer team must comply with provisions in the operable COA. (T-1). The UA must remain in the approved airspace and VFR provisions apply. (T-1).

6.1.1. (AFMC) VFR test activities approved outside visual contact from the operator or observers require detailed planning to ensure obstacles, terrain, and personnel/property are avoided by safe margins. The Lead SUAS-O is ultimately responsible for ensuring SUAS performance and weather conditions allow for such avoidance along all planned and contingency routings (lost command link, emergency return with an engine inoperative, etc.).

6.1.2. If the weather prevents continued flight under VFR on the planned route, the SUAS-O shall alter the route of flight, as necessary, so as to continue operations under VFR within approved airspace: (T-2)

6.1.2.1. To the destination. (T-2).

6.1.2.2. To land at a suitable location. (T-2).

6.2. Flight Operations under VFR.

6.2.1. National Airspace (NAS). SUAS-Os operating under VFR in the NAS shall adhere to the weather minimums listed in **Table 6.1**. (T-0).

6.2.1. (AFMC) AFMC SUAS operating VFR in the NAS shall adhere to the weather minima listed in AFI 11-502, Volume 3, Table 6.1 or the approved FAA COA, whichever is more restrictive.

6.2.1.1. (Added-AFMC) If the mission requires lower weather minima or IMC operations, justification shall be outlined in the test plan and approved via a waiver to this supplement. Units will submit waivers to AFRL/DO for review and coordination with AFMC/A3V for approval. (T-2).

6.2.2. Restricted Airspace. SUAS-Os operating under VFR in other than FAA airspace shall: (T-1).

6.2.2.1. Adhere to the International Civil Aviation Organization (ICAO) VFR weather minimums listed in **Table 6.2**.; or (T-1).

6.2.2.2. Comply with restrictions published in FLIP or FCG. (T-1).

6.3. Instrument Flight Rules (IFR). (T-1).

6.3.1. Only AFMC flight test shall operate SUAS under IFR and under the following conditions:

6.3.1.1. Operations shall be conducted in Restricted airspace.

6.3.1.2. Equipment shall be IFR certified.

Table 6.1. USAF VFR Cloud Clearance and Visibility Minimums (FAA Airspace Class).

	A	B	C
ITEM	FAA Airspace Class	Prevailing or Flight Visibility	Distance from Cloud
1	Class A	Not Applicable	Not Applicable
2	Class B	3 SMs	Clear of Clouds
3	Class C and Class D	3 SMs	500ft. below, 1,000 ft. above, and 2,000 ft. horizontal
4	Class E and G below 10,000 ft. MSL	3 SMs	500 ft. below, 1,000 ft. above, and 2,000 ft. horizontal
5	Class E and G at or above 10,000 ft. MSL	5 SMs	1,000 ft. below, 1,000 ft. above, and 1 SM horizontal

Table 6.2. USAF VFR Cloud Clearance and Visibility Minimums (ICAO Airspace Class).

	A	B	C
ITEM	ICAO Airspace Class	Flight Visibility	Distance from Cloud
1	Class A	Not Applicable	Not Applicable
2	Class B	8 KM above 10,000 ft. MSL. 5 KM below 10,000 ft. MSL	Clear of clouds
3	Class C, D, and E	Same as Class B.	1,500 m. horizontal 300 m (1,000 ft.) vertical
4	Class F and G Above 900m (3,000ft.) MSL or above 300m (1,000 ft.) above terrain, whichever is higher.	Same as Class B.	Same as Class C, D, and E.
5	Class F and G At and below 900m (3,000 ft.) or 300m (1,000 ft.) above terrain whichever is higher.	5 KM	Same as Class C, D, and E.

Chapter 7

REST AND DUTY DAY LIMITATIONS

7.1. Background Information. This section prescribes rest and maximum duty periods for operators of Air Force SUAS. Basic guidance for alertness management strategies and waiver authority procedures are also addressed.

7.2. Air Force Policy.

7.2.1. Commanders and mission planners shall assess the impact of factors that reduce SUAS-O alertness. (T-2). Specific considerations include the fatiguing effects of weather, temperature extremes, nighttime operations and use of night vision imaging systems, poor sleeping conditions (due to both location and time of day), mission delays, and restrictive personal equipment.

7.2.2. Unit commanders may recommend restricting duty time or extending rest periods to the MAJCOM approval authority. SUAS-Os shall terminate a mission/mission leg if safety may be compromised by fatigue factors, regardless of authorized duty period. (T-2).

7.2.2. (AFMC) To minimize risk due to fatigue, supervisors at all levels may further restrict duty period at their discretion for demanding events such as TDY/deployment operations, complex flight tests, and night operations.

7.3. Duty Day. SUAS-O duty day begins when the SUAS-O reports for duty and ends when all SUAS associated post-flight duties are accomplished (AV/GCS teardown, RTB). The maximum duty period (DP) for single-operator controlled SUAS is 12 hours and 14 hours for dual controlled (e.g. SrA Smith shows for work and performs 8 hours of primary non-SUAS-O duties. He can then perform 4 hours of single-operator SUAS-O duties.) Maximum continuous control time is specified in AFI 11-5MDS, Volume 3.

7.3.1. (Added-AFMC) Maximum continuous control time for AFMC SUAS-Os is 6 hours. (T-3).

7.3. (AFMC) Duty Day. For all AFMC SUAS test missions (Groups 1-3), waiver authority for these paragraphs is the responsible FOA. AFMC/A3 authorizes FOAs to extend the duty period, as outlined in 11-502, Volume 3, Paragraph 7.3, up to 2 hours for individual missions. Note that this authorization applies only to extending the duty periods, NOT reducing required rest periods or increasing continuous control time. The SUAS-O is not authorized to extend duty period. For all other waivers to this chapter forward the request through AFRL/DO to HQ AFMC/A3V. (T-2).

7.4. Rest Period. Rest is required prior to assuming SUAS-O duties. (T-2). Interruption of the rest period for any official duty reinitiates the rest cycle.

7.4.1. Rest is required prior to SUAS flight duties. The purpose is to ensure SUAS-Os are adequately rested before performing flight or flight-related duties. The rest period is a non-duty period of 12 hours. Rest is free time which includes time for meals, transportation, and sleep.

7.4.1. (AFMC) Time spent traveling (e.g., as a passenger or in a POV) to or from a TDY location does not count as crew rest for subsequent Duty Period. TDY/Deployment chiefs will apply judgment to adjust DP start time to unique situations such as lengthy travel times from billeting. The SUAS crew chief is responsible to the TDY/Deployment chief when TDY/deployed. IAW AFI 21-101, the SUAS-O will determine how long the crew chief can safely perform maintenance actions. As a minimum, the SUAS crew chief must have the opportunity to sleep 8 hours in each 24-hour period.

7.4.2. Interruption of rest. If the rest period is violated, it is the SUAS-O's responsibility to inform his supervisor and shall not perform SUAS-O duties until the rest requirement is satisfied. (T-2). Interruption of rest includes conducting official business over the telephone.

7.5. Scheduling Limitations. SUAS operators shall not consume alcoholic beverages within 12 hours of flight operations. Do not schedule SUAS-Os for flight duties when (T-2):

7.5.1. The conditions of paragraph 7.4 cannot be met.

7.5.2. The SUAS-O has any medical, mental health, or medication issue which would negatively impact the SUAS-O's ability safely operate the SUAS or which is likely to interfere with the SUAS-O's ability to maintain focus on flight responsibilities.

7.6. Alertness Management Strategies. Commanders, schedulers, aerospace medicine personnel, and SUAS-Os all share responsibility for dealing with the complex issue of cumulative fatigue.

7.6.1. SUAS-Os shall receive adequate rest to maintain optimum mental/physical functioning. (T-2). The principle factors in determining required rest are: the duration and intensity of work done, quality and duration of sleep in the previous several days, the time of day relative to the body's internal circadian clock, and the degree of circadian disruption (e.g., shift work or jet lag).

7.6.2. When an individual sleeps less than his/her physiologically required duration, or experiences poor quality sleep over successive days, fatigue develops. As little as two hours sleep loss can result in significant reductions in an individual's performance. Likewise delaying sleep too long results in excessive fatigue and degrades performance.

7.6.3. The failure to acquire sufficient sleep over two or more days results in cumulative sleep debt. Effects of cumulative sleep debt include physical and mental performance loss until the individual has achieved adequate sleep. For most individuals, two consecutive night's sleep is needed to fully recover from a significant sleep debt. During periods of high operations tempo, mission planners should give particular consideration to providing SUAS crews regular opportunities to recover from cumulative fatigue.

7.6.4. Skills critical to flying tend to be among the most susceptible to mental fatigue including monitoring tasks, embedded tasks (e.g., instructing while flying), and higher cognitive processes (such as problem solving in emergencies). Performance is most impaired during the period of the circadian trough, normally 0200 to 0600 hours. Therefore, the use of alertness management strategies must be considered for nighttime missions.

7.6.5. The instructions in this chapter cannot provide a solution to all the challenges posed by the 24-hour demands of Air Force SUAS operations. It is essential, therefore, that commanders use other reasonable means to sustain SUAS-O alertness and performance.

Consultation with aerospace medicine or other fatigue management experts is advisable. Examples of alertness management strategies that are currently available include tactics to promote effective rest and minimize pre-mission duration of wakefulness, such as extended rest periods, pre-positioning and sleep quarantine facilities; non-pharmacological countermeasures, such as bright light/physical activity breaks; pharmacological agents (no-go pills); and alertness management education and training. “Go” pills or stimulates are not authorized for SUAS operations.

Chapter 8

NORMAL OPERATING PROCEDURES

8.1. Read Files. Review SUASMAN and Unit Read Files before all SUAS missions. (T-3).

8.2. Checklists. Accomplish all checklists with strict discipline. A checklist is not complete until all items are accomplished. The SUAS-O operating the UA shall initiate/complete all checklists. (T-2). Operator checklists shall be used for all operations from preflight through post flight. (T-2).

8.2.1. Carry abbreviated checklists in checklist binders. The only pages/inserts authorized in checklist binders are: T.O./Operator's Manual checklists, MAJCOM-approved checklists, briefing guides, and approved information guides. Units may construct locally developed SUAS flight guides.

8.2.1.1. Make personal notes on checklists, briefing, or information guides in pencil, if desired. If added, all notes shall be current and not in conflict with AFI and MAJCOM supplements. (T2).

8.2.1.2. Abbreviated checklist items that do not apply to unit SUAS may be lined out in pen.

8.3. Video/Data Capture. Each flight shall be recorded using the system's data recorder in order to capture both telemetry and video data. (T-1). This data is used for training as well as review in the case of an incident or lost UA. Recordings may be discarded if there is no incident or mishap. Data recordings from any reportable SUAS incident shall be secured to support an investigation to determine cause. (T-1). Dispose of recordings as directed by MAJCOM Directorate of Safety. Data from incidents involving manned aircraft or violation of ATC procedures shall be provided to the MAJCOM Safety office and HQ AFSOC/A3V. (T-1).

8.3. (AFMC) Video/Data Capture. This paragraph is not to be construed to require video, telemetry, or recording equipment on AFMC SUAS operations. If so equipped, however, such devices shall be used to comply with the Video/Data Capture requirements.

8.4. Observers. Within non-segregated (shared use) airspace outside of Restricted or Warning Areas, observers shall be used. (T-0). Dedicated observers assist the SUAS-O in duties associated with safe aircraft separation, terrain/obstacle clearance avoidance, and cloud clearance. Observers shall be given sufficient training and situational rehearsal on VFR and right-of-way procedures to communicate clearly to the SUAS-O any instructions necessary to keep the UA clear of other air traffic, terrain/obstacles, and clouds. (T-0). Observer training shall be specified in the unit SUAS training program and must be approved by the unit commander. (T-3).

8.4.1. Observers shall meet medical standards prescribed in AFI 48-123 or provide a copy of a current FAA Second Class medical certificate. (T-1).

8.4.1. (AFMC) Unless higher medicals are otherwise imposed by FAA COA or host range operating provisions, additional observers not required by Air Force Instructions or FAA COA shall have a current Air Force medical clearance or current civilian medical physical. (T-3).

8.4.2. Observers shall possess and operationally check real-time communications link(s) to the SUAS-O prior to the UA entering or commencing flight operations within the observed airspace. (T-1). Maintain continual real-time communications with the controlling SUAS-O.

8.4.3. If the SUAS-O is unable to maintain real-time communications with the observer, the UA shall be returned home, landed, or returned to an area that provides the SUAS-O visual line-of-sight to the UA. (T-1).

8.4.4. Within Restricted or Warning Areas, Operational Risk Management mitigation may require observers to be employed.

8.4.5. Observer Duties. Observer(s) duties are to continuously observe assigned airspace sector(s) for any aircraft, balloon, or parachutist and make timely standardized traffic reports. If traffic becomes a factor to the UA, the observer assesses closure rate and projected proximity and makes a descriptive call to the SUAS-O controlling the UA. If traffic continues to pose a collision hazard and the SUAS-O controlling the UA has not indicated either awareness or initiation of an avoidance maneuver, the observer directs an avoidance maneuver. Advise the SUAS-O when reported traffic is no longer a factor.

8.4.5. (AFMC) Observers must be used when visual contact/visual range restrictions are imposed, and the SUAS is capable of travelling beyond the SUAS-O's visual contact/usable visual range. (T-3).

8.5. Post Flight Requirements. Complete Operators Flight Log after each flight (to include simulator flights) or as soon as possible in contingency operations. Every operator is required to record his/her flight to capture all the information required for entering into SUASMAN and maintain the log until all flights have been entered into transferred to SUASMAN as soon as possible. (T-1). **Exception:** AFMC is exempt from the requirement to use SUASMAN. Flight logs are used to track flight hours for each specific SUAS, which shall be used to determine currency, trend analysis and verify flight hours for upgrade training. AFMC shall develop a tailored Operators Log for AFMC test operations and USAFA research projects. (T-1).

8.5. (AFMC) Post Flight Requirements. AFRL/DO will develop standardized flight logs for SUAS units. In the absence of AFRL/DO flight logs, units may develop flight logs. Submit unit-developed forms to AFRL/DO for coordination with HQ AFMC/A3V for approval. All lead MAJCOM validated and approved flight planning software and systems are authorized. AFMC crewmembers are responsible for ensuring correct entry of flight planning data. The Unit Commander will ensure SUAS-Os are properly trained to use authorized flight planning software. (T-3).

Chapter 9

ABNORMAL OPERATING PROCEDURES

9.1. General. Conduct of flight operations that deviate from the briefed mission for reasons of adverse weather, low fuel/battery state, system abnormalities, or other unforeseen event are defined as “abnormal” and require specific actions.

9.2. Initial Actions. Maintain aircraft control and situational awareness. The general priority order of “Aviate, Navigate, Communicate” is the most effective method of handling abnormal events. Well integrated crews frequently accomplish these tasks in parallel but the priorities remain in order. First priority shall always be to maintain control of the aircraft and retain situational awareness. (T-1). Loss of the aircraft due to loss of situational awareness makes the rest of the process irrelevant. While aviating, the crew analyzes the situation and takes the proper action to mitigate the situation. Navigation shall be the second priority. (T-1). Correct analysis of the situation leads to the decision to continue the mission, navigate to a safe area for further action, or navigate towards a suitable recovery location while remaining clear of unauthorized airspace. Communicating information to appropriate agencies is the third priority. SUAS operations typically require airspace control agencies to be notified of any loss of link, navigational difficulty, or UA loss and mission control agencies to be notified of any change in mission capability.

9.3. Emergency Procedures (EP). Each SUAS technical order, operator’s manual, or equivalent vendor-provided publication specifies critical emergency procedures which shall be committed to memory and acted upon without reference to a checklist. These critical emergency procedures are distinguished from non-critical EPs by bold print (“Bold Face Emergency Procedures”). When encountering a system malfunction, maintain aircraft control, analyze the situation and select the appropriate emergency procedure. Execute the appropriate bold face procedure in the order specified. (T-1). The non-flying crewmember shall back up the flying crewmember to insure correct selection and execution of the EP. (T-1). The crew shall execute non-critical EPs with reference to the appropriate checklist. (T-1).

9.4. Impound GCS and UA. Impound the affected GCS and UA and preserve operations data for any of the following:

- 9.4.1. Uncommanded control inputs not resolved by published emergency procedures.
- 9.4.2. Loss of UA control resulting in forced landing or uncontrolled flyaway.
- 9.4.3. Spill out from authorized airspace. Release the GCS for operations only after data is preserved and the GCS is released by the investigating authority. An operations check is required to verify correct function before the GCS is returned to service.
- 9.4.4. Loss of UA or non-repairable damage. Report IAW **paragraph 11.3**.
- 9.4.5. **(Added-AFMC)** Any occurrence of flight termination.
- 9.4.6. **(Added-AFMC)** Any occurrence of fuel or power starvation or exhaustion.

Chapter 10

SAFETY/OPERATIONAL RISK MANAGEMENT

10.1. General. Commanders shall implement an Operational Risk Management (ORM) and mishap prevention program. (T-1). Commanders shall integrate ORM into SUAS mission planning and execution at every level. (T-1). ORM is a decision-making process to systematically evaluate possible courses of action, identify risks and benefits, and determine the best course of action for any given situation. ORM enables commanders, functional managers, supervisors, and individuals to maximize operational capabilities while limiting all dimensions of risk by applying a simple, systematic process appropriate for all personnel and functions both on- and off-duty. Application of the ORM process ensures more consistent results, while ORM techniques and tools add rigor to the traditional approach to mission accomplishment, thereby directly strengthening the Air Force's war fighting posture. See [Attachment 3](#) for sample ORM worksheet and flight authorization. **Exception:** AFMC shall develop a tailored Operational Risk Management (ORM) worksheet and shall define the ORM program requirements for AFMC test operations and USAFA research projects. (T-1).

10.2. ORM Principles. Four principles govern all actions associated with the management of risk. These principles, continuously employed, are applicable before, during, and after all tasks and operations.

10.2.1. Accept no unnecessary risk. All Air Force missions and daily routines involve risk. The most logical choices for accomplishing a mission are those that accomplish the mission while exposing personnel and resources to the lowest acceptable risk. Risk without a commensurate reward is unnecessary.

10.2.2. Make risk decisions at the appropriate level. Making risk decisions at the appropriate level establishes accountability. Those accountable for the success or failure of the mission must participate in the risk decision process.

10.2.3. Accept risk when benefits outweigh the costs. All potential benefits should be compared to all potential costs. The process of weighing risks against opportunities and benefits helps to maximize unit capability. Even high risk endeavors may be undertaken when there is a well-founded basis to believe the sum of the benefits exceeds the sum of the costs.

10.2.4. Integrate ORM into operations and planning at all levels. To effectively apply risk management, commanders must dedicate time and resources to integrate ORM principles into planning and operational processes. Risk assessment of operations is supportive when it's done as a normal way of conducting a mission, not an add-on process performed by people not otherwise involved.

10.3. Authorized Uses. SUAS shall be used in a safe and controlled manner and shall be used for official purposes only. (T-1). The SUAS-O must conduct a thorough Operational Risk Management assessment prior to any SUAS mission IAW Air Force Pamphlet 90-902, *Operational Risk Management Guidelines and Tools*. (T-1).

10.4. Human Factors. Human factor issues are of particular concern in establishing guidelines for safe UA flight. UA flight presents human challenges different from and beyond those of

manned flight primarily because the aircraft and its operator are not collocated. As compared to the pilot of a manned aircraft, an SUAS-O can be said to perform in relative “sensory isolation” from the vehicle under his/her control.

10.4.1. Small UAS can present operators with long periods of low workload which contributes to “vigilance-based stress.” Tasks associated with operating SUAS such as sustained visual scanning of displays requires constant attention and SUAS-Os and supervisors must be aware that alertness deteriorates over time.

Chapter 11

REPORTING PROCEDURES

11.1. General. HQ AFSOC has been tasked by the Office of the Secretary of Defense (OSD) to track and report the mission capable status of all AF SUAS. Air Force units with an operational SUAS mission shall keep SUAS status updated and current in SUASMAN. (T-1). OSD can generate a mission capable status report from within SUASMAN. Timely notification of SUAS mishaps is required in order to ensure accuracy of AF SUAS status reporting. **Exception:** AFMC and USAFA need not report status for test and/or research systems.

11.2. System Reporting.

11.2.1. Units shall track each system by the manufacturers' serial number and/or system number. (T-1). Mission capable status shall be determined by the complementary readiness of the following selected major subcomponents: UA, Ground Control Station (GCS), Remote Video Terminal (RVT) and payloads (typically electro-optical (EO) and infrared (IR) sensors). The mission capable status shall be reported IAW **paragraphs 11.2.2 through 11.2.3.**

11.2.2. Terms. The following terms shall be used to categorize systems, i.e., Fully Mission Capable (FMC), Partially Mission Capable (PMC) and Non-Mission Capable (NMC).

11.2.2.1. FMC means every UA, GCS, RVT and payload in a system is mission capable.

11.2.2.2. PMC means at least one UA, one GCS, and one payload is mission capable.

11.2.2.3. NMC means either all of the UA, the GCS, or all payloads are not mission capable. Any one of these conditions shall make the entire system NMC. **Note:** The reporting unit may subjectively downgrade system status to NMC if the system has no operational night payload (but an operational day payload) when a night payload is required for successful mission accomplishment.

11.2.3. Status Reporting Schedule. Equipment status shall be continually updated in the SUASMAN. This enables higher headquarters to determine current equipment status.

11.2.3. (AFMC) AFMC units with an operational SUAS mission will work with HQ AFSOC to report mission capable status of operational SUAS assets.

11.3. Mishap Reporting:

11.3.1. Mishaps resulting in the loss of an aircraft, non-repairable damage (does not apply to consumable or normal wear and tear parts) or requiring depot level repair, injury to personnel or damage to property shall be reported to the unit safety office within 48 hours. (T-2). The unit safety office shall forward the report to using and lead commands within 5 duty days. Impound the affected GCS and UA IAW **paragraph 9.4.**

11.3.1. (AFMC) Any assigned, attached, or temporary duty SUAS-O involved in a Class A or B mishap will be administratively grounded by the responsible FOA immediately following the mishap. Any SUAS-O involved in a Class A mishap will not perform operator duties with AFMC SUAS until re-authorized in writing by AFMC/A3. Forward copies of all grounding actions through AFRL/DO to AFMC/A3V and coordinate all return to flying

status actions for Class A mishaps through AFRL/DO to AFMC/A3V for AFMC/A3 approval. Any SUAS-O involved in a Class B mishap will not perform operator duties in AFMC SUAS until re-authorized in writing by the responsible FOA. Copies of all relative actions will be maintained in section four of affected individual's training folder.

11.3.2. Units conducting SUAS operations under the provisions of an approved FAA COA or Class G operation IAW other DOD/FAA MOA shall immediately provide initial notification to HQ AFSOC/A3OU via email (AFSOC.A3OU.WF@us.af.mil) or phone (850-884-4064 / 4074 / 5462; cell 850-902-7041) after any incident, accident, or mishap prior to conducting any additional flights. (T-0).

11.3.3. The unit safety office (or higher) will report mishaps using the Air Force Safety Automated System (AFSAS) IAW AFI 91-204, *Safety Investigations and Reports*, and AFMAN 91-223, *Aviation Safety Investigations and Reports*. (T-1). Reports are kept indefinitely in the AFSAS. The unit may maintain hard copies IAW AFI 91-204.

11.3.4. Mishaps that result in minor damage (does not apply to consumable or normal wear and tear parts) that can be repaired at home station and do not meet Class A, B, C or D thresholds shall be reported to the unit safety representative who shall determine if an AFSAS report is warranted. (T-2). System malfunctions or anomalies that result in loss of control or damage shall be reported through the unit safety office to the MAJCOM Safety office HQ AFSOC/A3 within 7 duty days. (T-2).

11.3.5. For the purposes of trend analysis, unintentional LOL incidents (other than brief incidents where link is regained and mission continued) shall be reported in SUASMAN and IAW AFMAN 91-223. **Exception:** AFMC test operations and USAFA research projects are exempt from the requirement to use SUASMAN but shall report these incidents IAW AFMC guidance.

11.3.6. Use the SUAS Incident/Mishap Worksheet in Attachment 2 to capture required information. Transfer this information to AFSOC Form 97 (or MAJCOM equivalent) upon return from the field. (T-2). Incident/mishap reports shall be processed IAW MAJCOM supplements to AFI 91204. (T-1). The names of the operators shall not be released to non-USAF agencies without the permission of the Air Force Representative to the FAA (AFREP) coordinating the investigation. (T-1). Combat losses shall be reported to MAJCOMS and HQ AFSOC/A3OU within 48 hours via e-mail to AFSOC.A3OU.WF@us.af.mil / SIPR: afsoc.UAV@afsoc.af.smil.mil or Fax: DSN 579-2026, Commercial (850) 884-2026. HQ AFSOC/A3OU shall then forward to AFFSA and HAF/A3O-AS.

11.3.6. (AFMC) Exemption from the requirement to use SUASMAN does not relieve AFMC units from reporting such events thru appropriate unit Safety channels.

11.3.7. Use standard security markings and classified handling procedures for classified reports. Do not enter classified information into AFSAS.

- 11.3.8. Refer all inquiries about SUAS mishaps to the appropriate Public Affairs (PA) office.
- 11.3.9. Deployed units may relay an incident report via text message in standard line format.

TOD D. WOLTERS, Lt Gen, USAF
Deputy Chief of Staff, Operations

(AFMC)

CATHERINE A. CHILTON, Major General, USAF
Director of Air, Space and Information Operations

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References*****Allied Communication Publication (ACP) 160, US Supplement 1****AFH 11-203, Volume 2, *Weather for Aircrews*, 16 May 2002**

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8 March 2007**AFPD11-5, *Small Unmanned Aircraft Systems (SUAS) Rules, Procedures and Service*, 17
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AFPD 13-2, Air Traffic, Airfield, Airspace, and Range Management, 7 August 2007

FAA Advisory Circular 20-130A, *Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors*

FAA Advisory Circular 20-138, *Airworthiness Approval of Global Positioning System (GPS) Navigation Equipment for use as a VFR and IFR Supplemental Navigation System*

FAA Advisory Circular 90-45A, *Approval of Area Navigation Systems for Use in the US National Airspace System*

FARPart 91, *General Operating and Flight Rules*

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

AFSOC Form 97, *AFSOC Aircraft Incident Report*

DOD Form 175-1, *Flight Weather Briefing*

Abbreviations and Acronyms

AC—Advisory Circulars

AFI—Air Force Instruction

AFRC—Air Force Reserve Command

AFMC—Air Force Materiel Command

AFSOC—Air Force Special Operations Command

AGL—Above Ground Level

ANG—Air National Guard

ATC—Air Traffic Control

C2—Command and Control

COA—Certificate of Waiver or Authorization

CONUS—Continental United States

DOD—Department of Defense

EP—Emergency Procedures

FAA—Federal Aviation Administration

FAR—Federal Aviation Regulation

FLIP—Flight Information Publication

FMC—Full Mission Capable

GCS—Ground Control Station

IAW—In Accordance With

ICAO—International Civil Aviation Organization

IFR—Instrument Flight Rules

MAJCOM—Major Command
MDS—Mission Design Series
MSL—Mean Sea Level
NANU—Notice Advisory to NAVSTAR Users
NAS—National Airspace System
NM—Nautical Miles
NOTAM—Notice To Airmen
OCONUS—Outside Continental United States
ORM—Operational Risk Management
PIC—Pilot in Command
PMC—Partially Mission Capable
SM—Statute Miles
SUA—Special Use Airspace
SUAS—Small Unmanned Aircraft System
SUAS-I—Small Unmanned Aircraft System Instructor
SUAS-O—Small Unmanned Aircraft System Operator
UA—Unmanned Aircraft
UAS—Unmanned Aircraft System
USAF—United States Air Force
USAFA—United States Air Force Academy
VFR—Visual Flight Rules
VMC—Visual Meteorological Conditions

Terms

Air traffic—Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

Air Vehicle—See Unmanned Aircraft (UA).

Controlled airspace—A generic term that covers the different classification of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions within which air traffic control service is provided to Instrumented Flight Rules (IFR) flights and to Visual Flight Rules (VFR) flights in accordance with the airspace classification (see the Aeronautical Information Manual).

Land—For purpose of this AFI, includes all actions appropriate to transition the UA from flight to the ground (e.g., recovery, wheeled or skid landing, parafoil recovery, deep stall landing, arrested engagement, etc.)

Lead SUAS-O—The SUAS-O specifically identified by responsible authority and tasked with the overall responsibility for the operation and safety of the SUAS mission. Equivalent to the Pilot-in-Command of a manned aircraft.

Maintenance—The inspection, overhauls, repairs, preservation, and/or the replacement of parts, but excludes preventive maintenance.

National Airspace System (NAS)—All of the airspace above the surface of the earth over the United States and its possessions.

Night—The time between the end of evening nautical twilight and the beginning of morning nautical twilight converted to local time.

Restricted area—Airspace designated in FAR 73 within which the flight of aircraft, while not prohibited, is subject to restriction(s).

Special Use Airspace (SUA)—Airspace designated by the FAA with specific vertical and lateral limits, established for the purpose of containing hazardous activities or activity that could be hazardous to nonparticipating aircraft. Limitation on nonparticipating aircraft may range from absolute exclusion to complete freedom of use within certain areas, depending upon activity being conducted. Comprises Restricted, Warning, and Prohibited areas.

SUAS Instructor (SUAS-I)—A SUAS crewmember who conducts training and assessments of SUAS-Os and SUAS unit trainers in designated SUAS and promotes safety among aircrew members. Training and assessments include air vehicle operation, qualification, unit employment, visual flight, and crew performance.

SUAS-O—An individual who has completed IQT in a specific UAS.

Takeoff—For purposes of this AFI, includes all actions required to transition the UA from ground to flight (e.g., launch, throwing, catapulting, wheeled takeoff, etc.)

Traffic pattern—The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport or airfield.

Training mission—Missions flown for flight qualification, refresher, or proficiency/currency training; ATP requirements, and authorized training exercises.

Unmanned Aircraft (UA)—An aircraft or balloon that does not carry a human operator and is capable of flight under remote control or autonomous programming. (Joint Publication 3-52). Also called AV. A UA may be expendable or recoverable, carries a payload, is not operated for sport or hobby, and does not transport passengers or crew. For purposes of compliance with 14 CFR 1, subchapter A, part 1.1., UAs are to be considered “aircraft,” typically either an “airplane” or “rotorcraft,” as defined in 14 CFR 1, subchapter A, part 1.1. (FAA refers to these aircraft as remotely operated aircraft).

Unmanned Aircraft System (UAS)—That system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft. (Joint Publication 3-52).

Attachment 1 (AFMC)

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

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AFI 21-101, *Aircraft and Equipment Maintenance Management*, 21 May 2015

AFMCI 11-201, *Supervision of Flight Operations*, 01 Aug 2007.

Adopted Forms

AFMC Form 73, *AFMC Flight Operations Waiver Request*

Abbreviations and Acronyms

AHAS—Avian Hazard Advisory System

BAM—Bird Avoidance Model

CWT—Combat Weather Team

DCMA—Defense Contract Management Agency

DUATS—Direct User Access Terminal

OG/CC—Operations Group Commander

FOA—Flight Operations Authority

OPCON—Operational Control

POV—Privately Owned Vehicle

USAFTPS—USAF Test Pilot School

Terms

Critical Phase of Flight—For AFMC SUAS, Critical Phases of Flight is defined as: Takeoff, low level (below MSA defined by 14 CFR 91.119), approach and landing.

Director – AFMC civilian equivalent having the same authority as a Squadron Commander

Flight Operations Authority —Defined and designated by AFMC/A3 in AFI 11-401, AFMC Sup, or any superseding Memoranda of Agreement: “The group commander designated (or

equivalent) in [AFI 11-401, AFMC Sup] Figure 1.1, who is responsible for the oversight of day-to-day flight operations and compliance with USAF and AFMC flight operations policies. FOAs also ensure ORM principles are emphasized before all flying activities.”

Instrument Meteorological Conditions (IMC)—Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

Self-Contained Approach—An arrival procedure, normally from a minimum IFR altitude, to a runway, using only navigational equipment on board the aircraft (GPS, radar, or other sensors). For AFMC SUAS, “runway” is construed for purposes of SCA requirements to also include any planned or preprogrammed autonomous landing/recovery site.

Small Unmanned Aerial Systems (SUAS) —One or more unmanned aircraft in DoD UAS Categories (“Groups”) 1-3, a control station, control and payload datalinks, and mission payloads, designed or modified not to carry a human pilot and operated through a remote or self-contained autonomous control interface. SUAS are exempt from meeting most applicable requirements of larger UAS or manned aircraft. The term RPA is specific to the Remotely Piloted Aircraft (the flying portion of the SUAS).

Standard Formation—A formation in which no participating aircraft is more than 1 NM horizontally and 100 feet vertically from the lead aircraft.

Terminal Instrument Procedures (TERPS) – Formal criteria for the formulation, review, approval and the publishing of procedures for IFR (Instrument Flight Rules) operations to and from civil and military airports.

Terrain Alert Warning System (TAWS)—Generic term for any on-board system taking inputs from terrain databases, radar altimeter, aircraft position sensors, etc. to activate a Ground Proximity Warning System or Automatic Ground Collision Avoidance System (AGCAS). Developed to help prevent Controlled Flight Into Terrain (CFIT) mishaps.

Traffic Collision Avoidance System (TCAS)—An airborne system that functions independently of the ground-based radar to provide collision avoidance protection between suitably equipped aircraft. TCAS I provides proximity warnings to pilots in the form of traffic advisories. TCAS II provides both traffic advisories and recommended vertical escape maneuvers, known as resolution advisories.

Visual Meteorological Conditions (VMC)—Meteorological conditions in which visual flight rules may be used; expressed in terms of visibility, ceiling height, and aircraft clearance from clouds along the path of flight. When these criteria do not exist, instrument meteorological conditions prevail and instrument flight rules must be followed.

Attachment 2

SUAS INCIDENT/MISHAP WORKSHEET

Table A2.1. SUAS Incident/Mishap Worksheet.

This worksheet should be accomplished in the field, whenever there is an incident that involves the loss of an Air Vehicle (AV), damage that renders the AV non-repairable, AV is not recovered, an injury occurred as a result of a SUAS operation, or there was an airspace violation. Use standard security markings and classified handling procedures for classified reports.			
1. Date (DD/MM/YYYY):	_____	Time (Local/Zulu):	_____
2. Owning Unit (Unit/Base):	_____		
3. System Type:	_____	Tail #:	_____
4. UA Recovered:	_____ Y	_____ N	_____
5. Location of Incident:	_____		
6. Name of Range or Airspace:	_____		
Did an Airspace Violation Occur?	_____ Y	_____ N	Details: _____
7. Flight Information:	_____	_____	_____
Using Unit (Unit/Base):	_____		
Channel/Frequency:	_____		
GPS Keyed:	_____ Y	_____ N	_____
Launch Time (Local/Zulu):	_____		
Land Time (Local/Zulu):	_____		
Battery Type:	_____		
GCS #:	_____		
Camera/Payload Type:	_____		
Flight Recorded?	_____ Y	_____ N	_____
Lighting:	_____ Dawn	_____ Day	_____ Dusk _____ Night _____
Problem(s) prior to launch:	_____		
Problem(s) during flight:	_____		
Mode of Flight:	_____	Commanded Altitude/throttle setting:	_____
Altitude at time of Incident: MSL _____ AGL _____ AV Heading (Magnetic):	_____		
Last Know Position (if fly away):	_____		
Loss of Link Indications:	_____		
8. Weather:	_____		
Clouds:	_____	Wind Speed:	_____
Temperature:	_____	Wind Direction:	_____
Precipitation:	_____	Visibility:	_____
9. Crew Information (Operator, Visual Observer, Site Lead/Supervisor):	_____		
SUAS-O (Name/Rank/Unit/Base):	_____		
Training Date/Location:	_____		

Crew Position: _____			
SUAS-O (Name/Rank/Unit/Base): _____			
Training Date/Location: _____			
Crew Position: _____			
SUAS-O (Name/Rank/Unit/Base): _____			
Training Date/Location: _____			
Crew Position: _____			
SUAS-O (Name/Rank/Unit/Base): _____			
Training Date/Location: _____			
Crew Position: _____			
10. Damage:			
Aircraft/System: _____			
DOD Property: _____			
Private Property: _____			
11. Injuries:			
Injured person(s) (Name/Rank/Unit/Base): _____			
Injury Suffered: _____			
Actions at time of injury: _____			
12. Completed by:			
Name/Rank: _____			
Unit/Office Symbol: _____			
Base: _____			
Duty Phone: DSN: _____ Commercial _____			

Attachment 3

ORM WORKSHEET AND FLIGHT AUTHORIZATION

Figure A3.1. Sample ORM Worksheet and Flight Authorization

Instructions: 1. Obtain "Authorized by" initials before flight. Any changes to SUAS crew members, systems or date of flight requires FA approval. 2. The Lead SUAS-O will initial "Go/No-go" after all members comply w/ medical, currency, and read file as applicable. 3. File this form in the unit prior to flight. Verbally update risks w/ your crew as circumstances change during flight. 4. The Lead SUAS-O will determine the overall risk level w/ inputs from crew, but <u>risk will be high if an asterisks item is annotated.</u> 5. Overall ORM approval levels: moderate = Site Lead or higher; high = Unit/DO or higher, asterisk items = Unit/CC or higher.						
SUAS Crew (list last names)	Go/No-go	Date of Flight	System(s)	Authorized by / Date		
Lead SUAS-O:	(initials)			/		
Purpose (Reward):						
Guest/VIPs flight authorized (yes or no):						
Risk						
SPECIFIC CONSIDERATIONS (Circle Applicable Moderate or High Items)						
MISSION	L	M	H	LOW	MODERATE	HIGH
Type / Complexity				Proficiency flight	Instruction, simple exercise	*Test mission or complex exercise participation (EW)
Deconfliction				Shared Air space under tower control	Multiple Shared Ground / Airspaces	*No formal deconfliction or direct comms available
Ground maneuvers				None	Mobile ops w/ troops	*Covert mobile ops; live fire
Overall MISSION is rated:						
EQUIPMENT	L	M	H			
Equipment and Spare Parts				Serviceable equip / parts	Spare parts available	*Likely to affect training
Configuration				Hand control/RSTA config	Two Hand controllers	
Overall EQUIPMENT is rated:						
TERRAIN (ENVIRONMENT)	L	M	H			
Launch / Recovery				No obstacles w/in 500m, or reportable damage not likely	Increased risk for AV damage	*Damage likely, or no CLS
Airspace Compliance				Within Visual Line of Sight (LOS)	Not in Visual LOS (restricted a/s), sufficient airspace is available	*Airspace is confined, moderate chance to violate clearance
Observed or Forecasted Weather				> Mins: (3 SMs, 500 ft below, 2000 ft horiz clouds)	at or above mins, or light precip, or winds near max limits, or gust factor > 5 knots	Potential for intermittent hazardous WX (T-storms, lightning, heavy precip)
Heat / Cold Stress				50 > Temps (F) < 85	Temps 40-50, 85-90	Temps < 40 or > 90
Overall TERRAIN is rated:						
TROOPS	L	M	H	See Back for Individual Assessments		
Overall TROOPS are rated:						
TIME	L	M	H			
Planning / preparation				Normal (3+ days notice)	Scheduled 24 hrs prior	Last minute
Execution				One Site or multiple sites	Multiple sites and/or training with an instructor	*Multiple sites, same location
Overall TIME is rated:						
Overall Mission Risk						
TOP RISKS FOR THIS MISSION			RISK MITIGATION FACTORS			
1						
2						
3						
Lead SUAS-O Signature _____ Additional signature as required _____						
Lead SUAS-O	L	M	H	Last name:		

Crew rest				Adequate crew rest	Met Crew Rest minimums	*Not crew rested
In-flight Fatigue (duty day)				< 8 Hours	8-10 Hours	10-12 Hours
Health / Long term fatigue /				no issues	illness, but able to fly or	*illness or meds affecting
Environmental hazards (insects)					mild fatigue	performance, feel very fatigued
Currency / Flight tasks				Proficient w/ all tasks	current, non-current w/ SUAS-I	*I do not feel comfortable as the Lead, SUAS-O or student
SUAS-O	L	M	H	Last name:		
Crew rest				Adequate crew rest	Met Crew Rest minimums	*Not crew rested
In-flight Fatigue (duty day)				< 8 Hours	8-10 Hours	10-12 Hours
Health / Long term fatigue /				no issues	illness, but able to fly or	*illness or meds affecting
Environmental hazards (insects)					mild fatigue	performance, feel very fatigued
Currency / Flight tasks				Proficient w/ all tasks	current, non-current w/ SUAS-I	*I do not feel comfortable as the Lead, SUAS-O or student
SUAS-O	L	M	H	Last name:		
Crew rest				Adequate crew rest	Met Crew Rest minimums	*Not crew rested
In-flight Fatigue (duty day)				< 8 Hours	8-10 Hours	10-12 Hours
Health / Long term fatigue /				no issues	illness, but able to fly or	*illness or meds affecting
Environmental hazards (insects)					mild fatigue	performance, feel very fatigued
Currency / Flight tasks				Proficient w/ all tasks	current, non-current w/ SUAS-I	*I do not feel comfortable as the Lead, SUAS-O or student
SUAS-O	L	M	H	Last name:		
Crew rest				Adequate crew rest	Met Crew Rest minimums	*Not crew rested
In-flight Fatigue (duty day)				< 8 Hours	8-10 Hours	10-12 Hours
Health / Long term fatigue /				no issues	illness, but able to fly or	*illness or meds affecting
Environmental hazards (insects)					mild fatigue	performance, feel very fatigued
Currency / Flight tasks				Proficient w/ all tasks	current, non-current w/ SUAS-I	*I do not feel comfortable as the Lead, SUAS-O or student
SUAS-O	L	M	H	Last name:		
Crew rest				Adequate crew rest	Met Crew Rest minimums	*Not crew rested
In-flight Fatigue (duty day)				< 8 Hours	8-10 Hours	10-12 Hours
Health / Long term fatigue /				no issues	illness, but able to fly or	*illness or meds affecting
Environmental hazards (insects)					mild fatigue	performance, feel very fatigued
Currency / Flight tasks				Proficient w/ all tasks	current, non-current w/ SUAS-I	*I do not feel comfortable as the Lead, SUAS-O or student
SUAS-O	L	M	H	Last name:		
Overall TROOPS are rated:						

Attachment 4

DOD UAS CATEGORIES

Figure A4.1. DOD UAS Categories.

UAS Category	Maximum Gross Takeoff Weight (lbs)	Normal Operating Altitude (ft)	Speed (KIAS)
Group 1	0-20	<1200 AGL	<100
Group 2	21-55	<3,500 AGL	<250
Group 3	<1320	<18,000 MSL	
Group 4	>1320	>18,000 MSL	Any Speed
Group 5			