Agricultural Airman Guidelines

NAAA-AAG

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Acknowledgments

This document is a product of the National Agricultural Aviation Association (NAAA) and National Agricultural Aviation Research and Education Foundation (NAAREF) Knowledge and Skills Ad-hoc Committee. Since 2018, veteran ag pilots throughout the US have come together to create, deliberate upon and refine the contents herein. Review and vetting has been provided by attorneys and stakeholders from state pesticide lead agencies, ag aircraft manufacturers and FAA. Thanks to all that have contributed in the completion of this document.

Purpose Statement

The Agricultural Airman Guidelines (AAG) are intended primarily to be a resource to assist operators, supervisors, pilots and FAA personnel when preparing for, or administering, a 14 CFR §137.19(e) Knowledge and Skills Test or Endorsement (Letter of Competency). Secondarily, and more generally, they serve as consistent safety education and training guidance for agricultural aviation operators and pilots whether it be for an initial evaluation of their knowledge and skills or a training review.

Agricultural Airman Guidelines Concept

The AAG is intentionally crafted in the framework of the Airman Certification Standards (ACS). The goal of the airman certification process is to ensure the applicant possesses the knowledge, ability to manage risks, and skill consistent with the privileges of the certificate or rating being exercised, in order to act as pilot-in-command (PIC). The ACS integrates these three factors to form a comprehensive standard for what an applicant must know, consider, and do for the safe conduct and successful completion of each Task to be tested on both the qualifying FAA knowledge test and the oral and flight portions of the practical test.

While not a certification standard, the AAG provides suggestions for the applicant in attaining and maintaining the knowledge, ability to manage risks and skills consistent with acting as PIC in conducting 14 CFR Part 137 agricultural aircraft operations.

The 14 CFR §137.19(e) Knowledge and Skills Test for agricultural aircraft operations measures mastery of the aeronautical knowledge areas required to conduct Part 137 operations. Other materials, such as handbooks in the FAA-H-8083 series and Advisory Circulars, such as AC 137-1B, provide guidance to applicants related to aeronautical knowledge, risk management, and flight proficiency.

Using the Guidelines

The AAG consists of **Areas of Operation** arranged in a logical sequence, beginning with Preflight Preparation and ending with Postflight Procedures. Each Area of Operation includes **Tasks** appropriate to that Area of Operation. Each Task begins with an **Objective** stating what the applicant should know, consider, and/or do. The Task then lists the aeronautical knowledge, risk management, and skill elements relevant to the specific Task, along with the conditions and standards for acceptable performance. The **References** for each Task indicate the source material for Task Elements, a comprehensive list of which can be found in Appendix A.

Each Task in the AAG is coded according to a scheme that identifies its Area of Operation within the AAG (137.<Area of Operation>.<Task>), and contains numbered Elements for Knowledge (K), Risk Management (R) and Skills (S). For Example, Knowledge Element 137.I.C.K2 can be decoded as follows:

137	AAG	Part 137 Agricultural Operations
I	**Area of Operation**	Regulatory Knowledge
C	**Task**	National Airspace System
K2	Task Knowledge Element	Charting Symbology

Some Tasks or Task Elements are applicable only for a specific category or class of aircraft. This is denoted by abbreviations in parentheses following the Task or Task Element as follows:

(FW)	Fixed Wing
(RW)	Rotorcraft
(UAS)	Uncrewed Aircraft System

The ultimate intention for AAG codes is to link them with training, education and testing to more precisely direct efforts in evaluating understanding of the necessary material. This can aid applicants, instructors and evaluators when preparing for, or administering, a Part 137 Knowledge and Skills Test.

Contents

137.I Regulatory Knowledge

137.I.A Regulatory Environment

Task	Regulatory Environment	
References	14 CFR Part 107; 14 CFR Part 133; 14 CFR Part 137; 49 USC §44807	
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with the regulatory environment of operating under Part 137.	
Knowledge	The applicant demonstrates an understanding of:	
	137.I.A.K1	14 CFR Part 137 General Knowledge
	137.I.A.K2	§137.19(e) requirements
	137.I.A.K3	FAA Order 8900.1
	137.I.A.K4	FAA Advisory Circular AC 137-1B
	137.I.A.K5	Regulatory knowledge of 14 CFR Part 105, 14 CFR Part 107, 49 USC §44807 (UAS)
	137.I.A.K6	14 CFR Part 133 (RW)
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.I.A.R1	Inaccurate use of available, current, documents and publications as reference material to understand the regulatory environment.
Skills	The applicant demonstrates the ability to:	
	137.I.A.S1	Understand and describe the requirements to act as PIC for various scenarios under Part 137.
	137.I.A.S2	Understand and describe the record keeping requirements of Part 137.
	137.I.A.S3	Correctly evaluate regulatory requirements for various scenarios given by the examiner.
	137.I.A.S4	Explain how and when Part 137 exempts flight operations from Part 91.

137.I.B Congested Area Operations

Task	Congested Area Operations	
References	14 CFR Part 137: §137.51, §137.53; NAAA-POG	
Objective	The applicant will understand when a congested area waiver is needed, explain and/or demonstrate the appropriate procedure(s) and subsequently aerial apply material per a congested area working plan (CAP).	
Knowledge	The applicant demonstrates an understanding of:	
	137.I.B.K1	How to determine if a congested area plan (CAP) is required.
	137.I.B.K2	The process for establishing a CAP per Part 137.
	137.I.B.K3	If a congested area is adjacent to a target application site, the applicant needs to show: (a) How to establish procedures to approach and depart the treatment area without flying over congested areas. (b) Describe how turnarounds will be made to avoid congested areas. (c) Explain safety precautions, including emergency considerations.
	137.I.B.K4	Understand what constitutes and mandates a plan for congested area aerial application
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.I.B.R1	Risks associated with application in a congested area.
	137.I.B.R2	Evaluation of risks in a particular target area based on being a congested area or having an adjacent congested area.
	137.I.B.R3	Possible differences in various safety precautions, including emergency considerations, for operations over or near congested areas.
Skills	The applicant demonstrates the ability to:	
	137.I.B.S1	Explain the pilot requirements for congested area operations.
	137.I.B.S2	Explain the aircraft requirements for congested area operations.
	137.I.B.S3	Explain the notification requirements for congested area operations.
	137.I.B.S4	Explain the approval requirements for congested area operations.

137.I.C National Airspace System

Task	National Airspace System	
References	14 CFR Part 71; 14 CFR Part 91, 93; FAA-H-8083-2A; AIM; Navigation Charts	
Objective	To determine that the applicant exhibits satisfactory knowledge, situational awareness, and skills associated with the National Airspace System (NAS) operating under VFR as a pilot	
Knowledge	The applicant demonstrates an understanding of:	
	137.I.C.K1	Types of airspace/airspace classes and associated requirements and limitations
	137.I.C.K2	Charting symbology
	137.I.C.K3	Special use airspace (SUA), special flight rules areas (SFRA), temporary flight restrictions (TFR), and other airspace areas
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.I.C.R1	Limitations and risks in various classes and types of airspace
Skills	The applicant demonstrates the ability to:	
	137.I.C.S1	Identify and comply with the requirements for basic VFR weather minimums and flight in different classes of airspace
	137.I.C.S2	Correctly identify airspace and operate in accordance with associated communication and equipment requirements
	137.I.C.S3	Identify the requirements for operating in SUA or within a TFR. Identify and comply with SATR and SFRA operations, if applicable

137.II Preflight Planning

137.II.A Application Site and/or Adjacent Property

Task	Preflight planning for application site and/or adjacent property	
References	WPS; Applicable Pesticide Label; AC 137-1B; National Aerial Applicator's Manual; State pollinator protection plan	
Objective	Determine that the applicant understands the potential impact of aerial application to persons and properties adjacent to the target area	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.A.K1	Factors that affect off-target deposition and drift
	137.II.A.K2	The risk of aerial application to adjacent crops, including: a The identification of adjacent crop(s) b The distances between the application location and adjacent crops c How to prevent drift to adjacent crops, people and adjacent areas in different types of wind/weather conditions
	137.II.A.K3	The risk of aerial application to adjacent bodies of water and the limitations that may exist because of standing water within or immediately adjacent to the target field
	137.II.A.K4	The risk of aerial application to nearby workers and/or observers
	137.II.A.K5	The risk of aerial application to adjacent occupied structures
	137.II.A.K6	Understand what constitutes and mandates a plan for Congested Area aerial application
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.A.R1	Risks associated with swath direction based on adjacent properties
	137.II.A.R2	Inadequate offset and/or utilize buffer zones based on adjacent properties
	137.II.A.R3	Possible off-target deposition factors
	137.II.A.R4	State pollinator protection plans
Skills	The applicant demonstrates the ability to:	
	137.II.A.S1	Identify sensitive crops on adjacent properties
	137.II.A.S2	Recognize and react appropriately to workers or people on adjacent properties
	137.II.A.S3	Avoid congested areas unless a congested area plan is filed and approved
	137.II.A.S4	Make configuration changes to mitigate drift potential

137.II.B Product to be Sprayed

Note: This task may be omitted per 8900.1 5-1734(B): "Inspectors may accept results of any state or local knowledge test as a portion of the FAA knowledge test, provided the pilot can produce bona fide test results or a license issued by the certifying agency."

Task	Understanding the Crop Protection Product to be applied, along with limitations, dangers, and precautions required according to the product label and Information on Safety Data Sheets (SDS)	
References	AC 137-1B; Applicable Pesticide Label; WPS; Applicable SDS; FAA Order 8900.1; National Pesticide Applicator Manual; National Aerial Applicator's Manual	
Objective	The applicant will be able to show understanding of the information presented on pesticide labels, SDS and be able to describe the procedures necessary to comply with the label information.	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.B.K1	Elements commonly found/described on pesticide labels
	137.II.B.K2	Steps required to meet the compliance requirements specified within the pesticide label in the application process
	137.II.B.K3	Administrative requirements regarding hazardous material
	137.II.B.K4	Details regarding the hazard(s) of a specific material
	137.II.B.K5	Information sources for SDS
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.B.R1	Notification requirements to field owner or responsible party before application begins
	137.II.B.R2	Field posting as required by the Worker Protection Standard
	137.II.B.R3	Repercussions of not properly briefing ground crew regarding use of PPE as required by the product label
	137.II.B.R4	First Aid instructions on the product label
Skills	The applicant demonstrates the ability to:	
	137.II.B.S1	Indicate where "label" and SDS information can be found and subsequent administrative availability within the business environment
	137.II.B.S2	Find and interpret safety data related to the materials typically dispensed by the operation
	137.II.B.S3	Ability to find and interpret endangered species protection requirements as required by the product label

137.II.C Weather Forecast

Task	Weather Forecasts and their use in Part 137 operations	
References	AC 137-1B; FAA-H-8083-25B; FAA-H-8083-28; FAA-S-ACS-7A; FAA-S-8081-16B; National Aerial Applicator's Manual; Aviation Weather Center	
Objective	Determine that the applicant exhibits knowledge in obtaining meteorological information and understanding environmental conditions for an aerial application operation.	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.C.K1	Multiple sources of aviation weather forecast and observation data
	137.II.C.K2	Meteorological conditions conducive to low visibility hazards
	137.II.C.K3	The impact of various forms of precipitation impacting aerial applications
	137.II.C.K4	Knowledge of minimum and maximum wind speeds and wind direction toward other adjacent properties
	137.II.C.K5	Understanding the formation, destruction, and adverse impacts of temperature inversions in aerial application
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.C.R1	Low-level temperature inversion conditions and other threats to on target application or application effectiveness
	137.II.C.R2	Personal minimums
	137.II.C.R3	Making appropriate decisions based on the information gathered
Skills	The applicant demonstrates the ability to:	
	137.II.C.S1	Obtain aviation weather information from DOC, NOAA, NWS local Weather Forecast Office (WFO) and other public and/or private meteorological information sources
	137.II.C.S2	Interpret weather information from DOC, NOAA, NWS local Weather Forecast Office (WFO) and other public and/or private meteorological information sources
	137.II.C.S3	Use and interpret results of smoke generation device or onboard weather monitoring system at the application target field

137.II.D Aircraft Airworthiness

Task	Verifying and understanding airworthiness requirements and inspections required for Part 137 operations	
References	14 CFR Part 43; 14 CFR Part 61; 14 CFR Part 91; 14 CFR Part 107; 14 CFR Part 137; CAM 8; AFM/POH; Manufacturer Service bulletins and Airworthiness Directive and other documents as applicable	
Objective	To verify that the applicant has an understanding of the Airworthiness requirements of his aircraft	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.D.K1	The documents required for Aircraft airworthiness (AROW)
	137.II.D.K2	The documents required onboard for Part 91 flights
	137.II.D.K3	The documents required onboard for Part 137 flights
	137.II.D.K4	The location of other documents and records for Part 137
	137.II.D.K5	The documents required for Part 107 flights (UAS)
	137.II.D.K6	The inspections required per Parts 91, 137, and 107 as applicable
	137.II.D.K7	The use of ADS-B and the inspections required for Part 91 operations
	137.II.D.K8	The equipment required for airworthiness and Part 137 operations
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.D.R1	Inoperative equipment discovered prior to flight and during flight
	137.II.D.R2	Aircraft maintenance and inspections as required by the specific operational needs
Skills	The applicant demonstrates the ability to:	
	137.II.D.S1	Locate and describe airplane airworthiness and registration information
	137.II.D.S2	Determine aircraft airworthiness
	137.II.D.S3	Locate and explain maintenance inspection records and requirements for the aircraft used in the operation
	137.II.D.S4	Apply appropriate procedures for operating with inoperative equipment as permitted

137.II.E Fuel Management

Note: The term "fuel" shall also refer to stored electrical energy reserves for battery powered aircraft

Task	Fuel Management or stored electrical energy management
References	14 CFR Part 43; 14 CFR Part 61; 14 CFR Part 91; 14 CFR Part 107; 14 CFR Part 137; CAM 8; AFM/POH; Manufacturer Service bulletins and Airworthiness Directive and other documents as applicable
Objective	To verify that the applicant has an understanding of the fuel requirements and reserve requirements of any particular flight operation in a Part 137 operation, as well as the requirements, recommendations, and best practices for hot-fueling
Knowledge	The applicant demonstrates an understanding of: **137.II.E.K1** How environmental conditions affect fuel requirements **137.II.E.K2** The factors affecting uneven fuel burn and fuel transfer between wings during application and flight (FW)
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.II.E.R1** Plans to have sufficient fuel to perform the application, return to base with 30 minutes of fuel reserve (day) **137.II.E.R2** Verifies that the aircraft has the appropriate amount of fuel before flight **137.II.E.R3** Maintains sufficient fuel reserve to make a safe landing at an alternate location
Skills	The applicant demonstrates the ability to: **137.II.E.S1** Calculate the fuel requirements based on ferry distance, size and complexity of the application, number of loads, and environmental conditions **137.II.E.S2** Monitor actual fuel flow as compared to predicted fuel flow and make adjustments as required **137.II.E.S3** Use good judgment to discontinue application and land if fuel consumption is greater than expected or becomes insufficient to complete application and land safely

137.II.F Weight and Balance

Task	Weight and Balance	
References	14 CFR Part 107; 14 CFR Part 137; AFM/POH; CAM 8; AC 137-1B; FAA-H-8083-1B; FAA-H-8083-25B; Manufacturer service bulletins and other technical publications as applicable; approved waivers and exemptions as applicable	
Objective	To determine that the applicant has the ability to ensure that loading the agricultural aircraft complies with the acceptable limits for aircraft weight and balance for the aircraft to be used	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.F.K1	The procedure for determining the weight and balance envelope for a given flight
	137.II.F.K2	The different maximum weight limitations based on the aircraft mission (Part 91 vs. Part 137 and special purpose loads, also difference between and internal vs. external load on a helicopter as applicable)
	137.II.F.K3	The change of the CG location and weight as fuel is burned and load is dispersed
	137.II.F.K4	The change in CG location and weight due to an emergency jettison of the load, and the change in flight characteristics during and due to this procedure
	137.II.F.K5	Operating limitations specific to the aircraft being used
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.F.R1	Understanding the importance of performing the weight and balance calculations prior to loading the aircraft
	137.II.F.R2	Instructs and monitors loading personal to prevent loading into an unsafe configuration
Skills	The applicant demonstrates the ability to:	
	137.II.F.S1	Calculate weight and CG location for reposition ferry scenario (no-load but full fuel)
	137.II.F.S2	Calculate weight and CG location for an empty, return to base scenario (no-load and 30-minute fuel)
	137.II.F.S3	Calculate weight and CG location for an intermediate load scenario (half-hopper capacity and full fuel)
	137.II.F.S4	Calculate weight and CG location for a maximum load scenario (full-loaded hopper and fuel-up to agricultural maximum gross weight)
	137.II.F.S5	Calculate weight and CG location for various other loading configurations (if applicable) such as: occupied observer seat, full and empty rinse tank scenarios, ferry fuel loading
	137.II.F.S6	Calculate and understand CG locations for external load operations*(RW)

137.II.G Flight Characteristics

Task	Flight Characteristics	
References	AFM/POH; FAA-H-8083-25B	
Objective	To Determine that the applicant can describe the flight characteristics of the agricultural aircraft chosen for Part 137 skills assessment	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.G.K1	Comparative aircraft sensitivities and control responses for pitch, roll, and yaw
	137.II.G.K2	Changes in aircraft flight characteristics from high gross weight through the decreasing gross weight change to that at minimum landing weight configuration
	137.II.G.K3	Stall characteristics (i.e., airplane design) and impending stall and full stall indications (i.e., how to recognize by sight, sound, or feel)
	137.II.G.K4	Factors and situations that can lead to a power-on or power-off stall and proper preventative actions
	137.II.G.K5	Fundamentals of stall recovery
	137.II.G.K6	Aerodynamics associated with spins in various airplane configurations, to include the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects
	137.II.G.K7	What causes a spin and how to identify the entry, incipient, and developed phases of a spin
	137.II.G.K8	Flying the aircraft in a manner that avoids turns and maneuvers that pose an unnecessary risk of stalls, and spins
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.G.R1	Chooses aircraft loading such that safe operations stay within the safe and approved envelope for the aircraft throughout the flight with changing weather conditions
	137.II.G.R2	Factors and situations that could lead to inadvertent stall, spin or loss of control
	137.II.G.R3	Range and limitations of stall warning indicators (e.g., aircraft buffet, stall horn, etc.)
	137.II.G.R4	Stall/spin risk when aircraft at high angles of attack and wing loading regardless of airspeed
Skills	The applicant demonstrates the ability to:	
	137.II.G.S1	Plan for the load being carried and how the aircraft will react with the given environmental conditions
	137.II.G.S2	Conduct turnarounds and other maneuvering in a manner that avoids operating in high-risk areas as it relates to stalls, and spins

137.II.H Aircraft Performance

Task	Aircraft Performance	
References	AFM/POH; FAA-H-8083-3C; FAA-H-8083-21B; FAA-H-8083-25B	
Objective	To have the applicant demonstrate understanding and applying elements related to aircraft performance and limitations through the use of AFM/POH charts, tables, and data	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.H.K1	The effects of temperature and density altitude on aircraft performance
	137.II.H.K2	The effects of types of agricultural product dispersal equipment (spreader vs. spray)
	137.II.H.K3	The effects of accumulation of contaminants or impacted material on the aircraft surfaces
	137.II.H.K4	The effect of both headwind and tailwind on takeoff and landing performance
	137.II.H.K5	The effect of aircraft age and normal wear and tear on aircraft performance
	137.II.H.K6	The impact of different runway conditions on performance including but not limited to type of surface, and recent precipitation on the runway
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.H.R1	Understand and mitigate risks associated with pushing the performance capabilities of the aircraft
	137.II.H.R2	Has a plan to mitigate risks associated with changing weather and its effects on performance
	137.II.H.R3	Understands and has a plan to mitigate risks associate with unexpected conditions (e.g. landing with a load partial or full, accidental overloading by ground crew)
	137.II.H.R4	Recognize and understand the effects of improper pilot inputs due to fatigue or other distractions and deficiencies
	137.II.H.R5	Has developed personal minimums for take-off and landing with regards to aircraft loading and performance
	137.II.H.R6	Accurately assesses the runway surface and condition prior to takeoff or landing
Skills	The applicant demonstrates the ability to:	
	137.II.H.S1	Calculate expected aircraft performance for maximum gross weight take-off distance and climb-rate at expected density altitude and wind conditions at the base airfield
	137.II.H.S2	Calculate expected fuel consumption for take-off, ferry, working power settings, and emergency alternate fuel if applicable
	137.II.H.S3	Calculate landing distance for maximum allowable gross weight at expected density altitude conditions at the base airfield and any alternate airport

137.II.I Aircraft and Spray Equipment Preflight Inspection

Task	Aircraft and Spray Equipment Preflight Inspection	
References	14 CFR Part 61; 14 CFR Part 91; 14 CFR Part 107; 14 CFR Part 137: §137.11; AFM/POH; AC 137-1B; National Aerial Applicator's Manual; Other equipment documentation as applicable; Airworthiness Directives and Service bulletins as applicable, STCs as applicable	
Objective	Determine that the applicant understands preflight inspection procedures and signs of common aircraft failures and application equipment being used for 137 operations.	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.I.K1	The aircraft preflight inspection checklist items
	137.II.I.K2	Common failures and inspection points of aircraft spray equipment
	137.II.I.K3	Common airframe and powerplant failures for aircraft being used
	137.II.I.K4	Common failures and inspection points of loading and fueling and/or charging equipment
	137.II.I.K5	Effects of a failure or leak of different components of the aircraft spray system
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.I.R1	Proper checklist use when inspecting the aircraft and other systems
	137.II.I.R2	Takes appropriate correction or mitigation actions of leaks or other failures of the aircraft spray system
	137.II.I.R3	Promptly terminates loading or spraying activities upon detection of a defect, failure, or leak as appropriate
Skills	The applicant demonstrates the ability to:	
	137.II.I.S1	Detect common defects in aircraft spray system prior to flight
	137.II.I.S2	Take corrective actions promptly upon discovery of spray system defects or failures
	137.II.I.S3	Detects common defects in the aircraft powerplant and/or airframe
	137.II.I.S4	Take corrective actions promptly upon discovery of aircraft defects

137.II.J Spray System Calibration, Characterization and Measurement

Task	Dispersal system calibration and operation	
References	National Aerial Applicator's Manual; USDA Atomization Models	
Objective	Determine that the applicant understands how to calibrate the aircraft spray system and operate the spray system to ensure the proper spray application rate is achieved over the entire target field.	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.J.K1	The variables that determine spray application rate and how they impact the spray application rate: (a) Ground speed (b) Effective swath width (c) Boom and nozzle flow rate
	137.II.J.K2	How nozzle flow rate is measured
	137.II.J.K3	How orifice size and pressure determine nozzle flow rate and droplet size
	137.II.J.K4	How to adjust calibration variables on the aircraft's spray system
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.J.R1	How the use of a flow control system can impact nozzle pressure in a manner that increases potential for small droplet formation
	137.II.J.R2	Incorrect use of a flow control system to change the spray application rate instead of selecting differently sized nozzle orifices
Skills	The applicant demonstrates the ability to:	
	137.II.J.S1	Determine a spray application rate and droplet spectrum from a label and configure the aircraft to apply that rate and droplet size
	137.II.J.S2	Operate the spray system in a manner that maintains the correct spray application rate and droplet spectrum
	137.II.J.S3	Verify the system is properly calibrated by verifying: (a) Flow rate from each nozzle is correct (b) Amount of spray dispensed from hopper is correct for size of acreage treated

137.II.K Spray Pattern Changes in Response to Airspeed

Task	Spray pattern changes in response to airspeed (above/below transitional)(UAS/Powered Lift only)
References	AC 137-1B; NAAA-POG; USDA Atomization Models
Objective	The applicant explains and demonstrates the ability to apply spray material across airspeed range above and below transitional lift.
Knowledge	The applicant demonstrates an understanding of: **137.II.K.K1** The effect of hover on droplet spectrum **137.II.K.K2** The effect of low airspeeds on droplet spectrum **137.II.K.K3** The effect of nonlinear (turning) flight on droplet spectrum and swath width
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.II.K.R1** Airspeed and other factors that contribute to droplet sizes which may lead to off target drift **137.II.K.R2** Maintenance of target airspeed throughout the application
Skills	The applicant demonstrates the ability to: **137.II.K.S1** Apply spray material across airspeed range above and below transitional lift **137.II.K.S2** Correctly adjust spray equipment to maintain optimum droplet spectrum at various airspeeds both below and above transitional lift

137.II.L Pilot

Task	Pilot qualifications, documents, records and readiness for flight	
References	14 CFR Part 61; 14 CFR Part 91: §91.103, §91.505; 14 CFR Part 107; 14 CFR Part 137; AFM/POH; AC 68-1A; AC 137-1B; FAA-H-8083-1B, FAA-H-8083-2A; FAA-H-8083-25B; Manufacturer service bulletins; STCs as applicable	
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with operating as pilot-in-command (PIC) as an aerial application pilot	
Knowledge	The applicant demonstrates an understanding of:	
	137.II.L.K1	§137.11, §137.33, and §137.57 operation certificate requirements
	137.II.L.K2	§61.3 and §137.19(b, c, e) and/or Part 107 certification requirements for pilots
	137.II.L.K3	§137.19(d) and §91.203, §91.407, §91.409, §91.419 certification and documentation requirements for aircraft
	137.II.L.K4	Exemptions and waivers to Part 137 and Part 107 as applicable to the specific company operations
	137.II.L.K5	§137.71 record keeping requirements
	137.II.L.K6	§91.103 and/or §107.49 actions requirement for pilots including: (a) Weather information (b) Runway lengths (c) Performance calculations (takeoff, landing, fuel and/or power requirements) (d) Weight and balance calculations (e) Airspace restrictions (f) Other hazards to flight
	137.II.L.K7	Use of Aircraft Flight Manual to determine aircraft loading, or the use of CAM8 for special purpose load in excess of TCDS maximum weight, if required, with reference to manufacturer service bulletins if appropriate
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.II.L.R1	Ensures all required documents and records are up to date, unexpired, and valid before beginning aerial application operations
	137.II.L.R2	Uses IMSAFE checklist to ensure readiness and fitness for flight
	137.II.L.R3	Manages rest and duty schedule to reduce and mitigate fatigue
	137.II.L.R4	Accurately assess the risk of the particular operation and adjusts as appropriate

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Skills	The applicant demonstrates the ability to:	
	137.II.L.S1	Identify, Locate, and Produce each of the required documents for the Part 137 Operation
	137.II.L.S2	Identify, Locate, and Produce each of the required documents for the Aerial Application Aircraft
	137.II.L.S3	Identify, Locate, and Produce each of the required documents for the pilot in command of the aircraft engaged in aerial application operations
	137.II.L.S4	Explain requirements for aircraft performance data including takeoff and landing distances for the planned loading scenario
	137.II.L.S5	Explain requirements for aircraft weight and balance data and limits, including the special purpose load

137.III Mixing / Loading / Fueling

137.III.A Ground Crew Briefing

Task	Understanding the Information on Safety Data Sheets (SDS) and pesticide product labels and briefs the ground crew appropriately	
References	AC 137-1B; WPS; Applicable Pesticide Label and SDS; National Pesticide Applicator Manual; National Aerial Applicator's Manual; NFPA 407: see "Hot Fueling"	
Objective	The applicant will be able to show understanding of the information presented on pesticide labels and be able to describe the procedures necessary to comply with the label information	
Knowledge	The applicant demonstrates an understanding of:	
	137.III.A.K1	Elements commonly found/described on pesticide labels
	137.III.A.K2	Compliance requirements specified within the material label in the application process
	137.III.A.K3	Administrative requirements for handling hazardous material
	137.III.A.K4	Unique hazard(s) of a specified material
	137.III.A.K5	Information sources for SDS
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.III.A.R1	Notification of field owner or responsible party before application begins
	137.III.A.R2	Proper posting of field as required by the Worker Protection Standard
	137.III.A.R3	Uses an SOP to ensure safe fueling procedures that may include procedures for rapid refuel aka "Hot Fueling"
Skills	The applicant demonstrates the ability to:	
	137.III.A.S1	Indicate where Label and SDS information can be found and subsequent administrative availability within the business environment
	137.III.A.S2	Ability to find and interpret safety data related to the materials typically dispensed by the operation
	137.III.A.S3	Follow procedures to safely refuel the aircraft

137.III.B Personal Protective Equipment

Task	Understanding the Use of Personal Protection Equipment
References	WPS; AC 137-1B; OSHA Guidelines; National Pesticide Applicator Manual; National Aerial Applicator's Manual
Objective	Determine that the applicant knows and understands why the various degrees of personal protection equipment (PPE) are to be worn by applicators, handlers, and early entry personnel in the aerial application process.
Knowledge	The applicant demonstrates an understanding of: **137.III.B.K1** The types of proper PPE for: (a) Eye wear (b) Gloves (c) Clothing, including coveralls or aprons (d) Headgear (e) Shoes (f) Respirator **137.III.B.K2** The types and amount of PPE that must be worn for various degrees of hazard posed by crop protection materials as described by their labels: (a) For pesticide Handlers, mixers, and loaders (ground personnel including loaders and/or field spotters) (b) For early entry ground personnel (UAS recovery, spotters, observers, in-field loading operations, emergency response personnel, early entry ag workers, on-site remote pilots) (c) For pilots in closed cockpit aircraft (d) For remote pilots located adjacent to the treatment area. (UAS)
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.III.B.R1** Utilization of proper PPE for the type of application operations to be performed **137.III.B.R2** Selects and supervises the utilization of proper PPE for the ground crew and others under supervision of the PIC for the operations to be performed
Skills	The applicant demonstrates the ability to: **137.III.B.S1** Properly fit and don various PPE equipment including gloves, eye wear, and respirators applicable to the products that will be used in the operation **137.III.B.S2** Identify required PPE for pilot. Handler, and early entry field workers based on the product label information

137.III.C Training and Documentation

Task	Understand the training and documentation required for mixers/loaders and personnel fueling aircraft	
References	WPS	
Objective	Determine what an Operator is responsible for with regards to training and documenting training for mixers and loaders	
Knowledge	The applicant demonstrates an understanding of:	
	137.III.C.K1	General Responsibilities of Agricultural Employers
	137.III.C.K2	Additional Worker Employer Requirements
	137.III.C.K3	Additional Handler Employer Requirements
	137.III.C.K4	Requirements for Employers of Commercial Pesticide Handlers
	137.III.C.K5	State laws that may require a mixer/loader to be licensed by the state
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.III.C.R1	Requirements set forth by the WPS
	137.III.C.R2	Requirements set forth by the state or governing agency for the specific area of operation
Skills	The applicant demonstrates the ability to:	
	137.III.C.S1	Produce and maintain documents that confirm training required in WPS
	137.III.C.S2	Confirm ground crew licensure, as required by the state or governing agency for the specific area of operation

137.IV Takeoff

137.IV.A Weather Conditions

Task	Ensure pilot understands effects of weather on takeoff performance. Ensure pilot is aware of weather requirements to conduct the flight safely.	
References	14 CFR Part 91: §91.103, §91.151, §91.155, §91.157; 14 CFR Part 137: §137.19(e)(2)(i); AFM/POH; Boldmethod	
Objective	Determine that the pilot can ensure a safe takeoff with appropriate load for the given weather conditions	
Knowledge	The applicant demonstrates an understanding of:	
	137.IV.A.K1	Flight rules required to conduct the flight legally and safely
	137.IV.A.K2	Weather effects on takeoff performance with regards to load, wind, and temperature at the field elevation (DA)
	137.IV.A.K3	Know the max demonstrated crosswind for the aircraft being flown
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IV.A.R1	Risks associated with taking off in a loaded aircraft in questionable weather
	137.IV.A.R2	Impact of weather on executing a safe takeoff
	137.IV.A.R3	Calculation of crosswind components and ensure that the current crosswind component does not exceed the aircraft and pilot capability
Skills	The applicant demonstrates the ability to:	
	137.IV.A.S1	Determine DA and its effects on takeoff performance
	137.IV.A.S2	Identify tailwind effects on takeoff performance
	137.IV.A.S3	Identify the potential for gusting or "dust devils" and rapidly developing convective activity
	137.IV.A.S4	Understand the concept of the 50/70 rule of thumb. At 50% runway, aircraft should be at 70% V_R.
	137.IV.A.S5	Use proper control inputs to compensate for the crosswind

137.IV.B Runway Surface Conditions

Task	Runway Surface Evaluation
References	AFM/POH; NAAA-POG; Current NOTAMS for public use airports
Objective	The applicant will be able to explain the impact of various runway surfaces and/or conditions on take-off roll.
Knowledge	The applicant demonstrates an understanding of: **137.IV.B.K1** The impact of runway surface type: (a) Smooth asphalt (b) Hard-pack dirt (c) Grass with varying lengths (d) Short-cut crop, e.g. wheat stubble, alfalfa (e) Uneven surface **137.IV.B.K2** Published aircraft performance charts, using which the applicant can estimate: Estimated take-off roll given various useful loads Estimating distances to clear obstacles given various useful loads
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IV.B.R1** Effect of all combinations of runway surface to execute a safe landing or takeoff
Skills	The applicant demonstrates the ability to: **137.IV.B.S1** Identify features of an airstrip that may adversely affect a safe takeoff **137.IV.B.S2** Identify reasonable load reductions if required

137.IV.C Normal Takeoff and Climb

Task	Normal Takeoff and Climb	
References	AFM/POH; FAA-H-8083-2A, FAA-H-8083-3C; FAA-H-8083-23; AIM	
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a normal takeoff, climb operations, and rejected takeoff procedures. Note: If a crosswind condition does not exist, the applicant's knowledge of crosswind elements must be evaluated through oral testing.	
Knowledge	The applicant demonstrates an understanding of:	
	137.IV.C.K1	Effects of atmospheric conditions, including wind, on takeoff and climb performance
	137.IV.C.K2	Best angle of climb speed (V_X) and rate of climb speed (V_Y)
	137.IV.C.K3	Appropriate airplane configuration
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IV.C.R1	Proper runway selection based on pilot capability, airplane performance and limitations, available distance, and wind
	137.IV.C.R2	Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition
	137.IV.C.R3	Abnormal operations procedures, to include planning for: (a) Rejected takeoff (b) Engine failure in takeoff/climb phase of flight
	137.IV.C.R4	Collision hazards, to include crewed and uncrewed aircraft, terrain, obstacles, wires, vehicles, towers, vessels, persons, and wildlife
	137.IV.C.R5	Low altitude maneuvers including stall, spin, or CFIT
	137.IV.C.R6	Distractions, loss of situational awareness, or improper task management

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Skills	The applicant demonstrates the ability to:	
	137.IV.C.S1	Complete the appropriate checklist
	137.IV.C.S2	Make radio calls as appropriate
	137.IV.C.S3	Verify assigned/correct runway
	137.IV.C.S4	Ascertain wind direction with or without visible wind direction indicators
	137.IV.C.S5	Position the flight controls for the existing wind
	137.IV.C.S6	Clear the area; taxi into takeoff position and align the airplane on the runway centerline (ASEL, AMEL) or takeoff path (ASES, AMES)
	137.IV.C.S7	Confirm takeoff power and proper engine and flight instrument indications prior to rotation (ASEL, AMEL)
	137.IV.C.S8	Rotate and lift off at the recommended airspeed and accelerate to V_Y
	137.IV.C.S9	Establish a pitch attitude to maintain the manufacturer's recommended speed or $V_Y \pm 5$ knots
	137.IV.C.S10	Configure the airplane in accordance with manufacturer's guidance
	137.IV.C.S11	Maintain $V_Y \pm 5$ knots to a safe maneuvering altitude
	137.IV.C.S12	Maintain directional control and proper wind-drift correction throughout takeoff and climb
	137.IV.C.S13	Comply with noise abatement procedures

137.IV.D Soft-Field Takeoff and Climb

Task	Soft-Field Takeoff and Climb
References	AFM/POH; FAA-H-8083-2A; FAA-H-8083-3C; AIM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a soft-field takeoff, climb operations, and rejected takeoff procedures
Knowledge	The applicant demonstrates an understanding of: **137.IV.D.K1** Effects of atmospheric conditions, including wind, on takeoff and climb performance **137.IV.D.K2** Best angle of climb speed (V_X) and Best rate of climb speed (V_Y) **137.IV.D.K3** Appropriate airplane configuration **137.IV.D.K4** Ground effect **137.IV.D.K5** Importance of weight transfer from wheels to wings **137.IV.D.K6** Left turning tendencies
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IV.D.R1** Selection of runway based on pilot capability, airplane performance and limitations, available distance, and wind **137.IV.D.R2** Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition **137.IV.D.R3** Abnormal operations, to include planning for: (a) Rejected takeoff (b) Engine failure in takeoff/climb phase of flight **137.IV.D.R4** Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife **137.IV.D.R5** Low altitude maneuvering including, stall, spin, or CFIT **137.IV.D.R6** Distractions, loss of situational awareness, or improper task management

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Skills	The applicant demonstrates the ability to:	
	137.IV.D.S1	Complete the appropriate checklist
	137.IV.D.S2	Make radio calls as appropriate
	137.IV.D.S3	Verify assigned/correct runway
	137.IV.D.S4	Ascertain wind direction with or without visible wind direction indicators
	137.IV.D.S5	Position the flight controls for the existing wind
	137.IV.D.S6	Clear the area, maintain necessary flight control inputs, taxi into takeoff position and align the airplane on the runway centerline without stopping, while advancing the throttle smoothly to takeoff power
	137.IV.D.S7	Confirm takeoff power and proper engine and flight instrument indications
	137.IV.D.S8	Establish and maintain a pitch attitude that will transfer the weight of the airplane from the wheels to the wings as rapidly as possible
	137.IV.D.S9	Lift off at the lowest possible airspeed and remain in ground effect while accelerating to V_X or V_Y, as appropriate
	137.IV.D.S10	Establish a pitch attitude for V_X or V_Y, as appropriate, and maintain selected airspeed ± 5 knots during the climb
	137.IV.D.S11	Configure the airplane after a positive rate of climb has been verified or in accordance with airplane manufacturer's instructions
	137.IV.D.S12	Maintain V_X or V_Y, as appropriate, ± 5 knots to a safe maneuvering altitude
	137.IV.D.S13	Maintain $V_Y \pm 5$ knots to a safe maneuvering altitude
	137.IV.D.S14	Maintain directional control and proper wind-drift correction throughout takeoff and climb
	137.IV.D.S15	Comply with noise abatement procedures

137.IV.E Short-Field Takeoff and Maximum Performance Climb

Task	Short-Field Takeoff and Climb
References	AFM/POH; FAA-H-8083-2A, FAA-H-8083-3C; AIM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a short-field takeoff, maximum performance climb operations, and rejected takeoff procedures
Knowledge	The applicant demonstrates an understanding of: **137.IV.E.K1** Effects of atmospheric conditions, including wind, on takeoff and climb performance **137.IV.E.K2** Best angle of climb speed (V_X) and Best rate of climb speed (V_Y) **137.IV.E.K3** Appropriate airplane configuration
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IV.E.R1** Selection of runway based on pilot capability, airplane performance and limitations, available distance, and wind **137.IV.E.R2** Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition **137.IV.E.R3** Abnormal operations, to include planning for: (a) Rejected takeoff (b) Engine failure in takeoff/climb phase of flight **137.IV.E.R4** Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife **137.IV.E.R5** Low altitude maneuvering including, stall, spin, or CFIT **137.IV.E.R6** Distractions, loss of situational awareness, or improper task management

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Skills	The applicant demonstrates the ability to:	
	137.IV.E.S1	Complete the appropriate checklist
	137.IV.E.S2	Make radio calls as appropriate
	137.IV.E.S3	Verify assigned/correct runway
	137.IV.E.S4	Ascertain wind direction with or without visible wind direction indicators
	137.IV.E.S5	Position the flight controls for the existing wind
	137.IV.E.S6	Clear the area, maintain necessary flight control inputs, taxi into takeoff position and align the airplane on the runway centerline without stopping, while advancing the throttle smoothly to takeoff power
	137.IV.E.S7	Apply brakes while setting engine power to achieve maximum performance ns
	137.IV.E.S8	Confirm takeoff power prior to brake release and verify proper engine and flight instrument indications prior to rotation
	137.IV.E.S9	Rotate and lift off at the recommended airspeed and accelerate to the recommended obstacle clearance airspeed or $V_X \pm 5$ knots
	137.IV.E.S10	Establish a pitch attitude that will maintain the recommended obstacle clearance airspeed or $V_X \pm 5$ knots until the obstacle is cleared or until the airplane is 50 feet above the surface
	137.IV.E.S11	Establish a pitch attitude for V_Y and accelerate to $V_Y \pm 5$ knots after clearing the obstacle or at 50 feet AGL if simulating an obstacle. Configure the airplane in accordance with the manufacturer's guidance after a positive rate of climb has been verified
	137.IV.E.S12	Configure the airplane in accordance with the manufacturer's guidance after a positive rate of climb has been verified
	137.IV.E.S13	Maintain $V_Y \pm 5$ knots to a safe maneuvering altitude
	137.IV.E.S14	Maintain directional control and proper wind-drift correction throughout takeoff and climb
	137.IV.E.S15	Comply with noise abatement procedures

137.IV.F Other Takeoff Techniques

Task	Takeoff Techniques	
References	14 CFR Part 91; 14 CFR Part 137: §137.19(e)(2)(i); AFM/POH; FAA-H-8083-3C; FAA-H-8083-25B; AIM	
Objective	The applicant will be able to explain and/or demonstrate techniques for short- or soft-field takeoff	
Knowledge	The applicant demonstrates an understanding of:	
	137.IV.F.K1	What constitutes a soft or short field
	137.IV.F.K2	Effects of surface composition, texture, and conditions on takeoff and landing distances
	137.IV.F.K3	Rotorcraft takeoff procedures for departing both ground and truck or elevated platform
	137.IV.F.K4	Rotorcraft takeoff procedures for use in dusty conditions
	137.IV.F.K5	Takeoff technique for aircraft being used
	137.IV.F.K6	Manufacturer recommended speeds and techniques applicable to the aircraft being used for the test
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IV.F.R1	Short or soft field takeoff techniques
	137.IV.F.R2	Appropriate key point selection for various stages of the take off for possibly aborting, and/or dumping of the load
	137.IV.F.R3	Appropriate utilization of checklist or memory items prior to takeoff
	137.IV.F.R4	Clear runway and airspace prior to takeoff and show an established plan for collision avoidance during and immediately after takeoff
	137.IV.F.R5	Runway surface for takeoff is in good condition free of debris, is in a safe location, and is prepared for operations
	137.IV.F.R6	Common takeoff emergencies and have a contingency plan for those applicable situations

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Skills	The applicant demonstrates the ability to:	
	137.IV.F.S1	Demonstrate short-field takeoff technique at maximum gross weight following Manufacturers procedures and speeds (FW)
	137.IV.F.S2	Demonstrate soft-field take-off technique at maximum gross weight following manufacturers procedures and speeds (FW)
	137.IV.F.S3	Discuss collision avoidance procedure for any obstacles in proximity to the airstrip
	137.IV.F.S4	Demonstrate a normal takeoff at maximum takeoff weight following manufacturers procedures and speeds (RW)
	137.IV.F.S5	Demonstrate a takeoff at maximum takeoff weight from an elevated platform and transition through effective translation lift (ETL) (RW)
	137.IV.F.S6	Demonstrate a takeoff in dusty conditions (RW)
	137.IV.F.S7	Complete all takeoff maneuvers in a smooth controlled manner that ensures safety is never in jeopardy
	137.IV.F.S8	Demonstrate all maneuvers with no more than +10 or -5 Knots Indicated Air Speed (KIAS) when measurement or monitoring of those speeds is possible by the examiner

137.IV.G Takeoff Emergency Response Plan

Task	Emergency or Unexpected Events during Takeoff Operations	
References	AFM/POH; FAA-H-8083-21B; NAAA-POG; NAAREF Dumping a Load Video	
Objective	The applicant will be able to explain and/or demonstrate actions to take in the event of unexpected or emergency scenario during takeoff	
Knowledge	The applicant demonstrates an understanding of:	
	137.IV.G.K1	The aerodynamics, CG, and stability implications of emergency jettison of the load
	137.IV.G.K2	Aircraft control upon emergency dumping a full load: (a) During a rejected takeoff (b) Upon engine problem/failure in takeoff/climb-out flight phase
	137.IV.G.K3	Desired emergency response flight paths
	137.IV.G.K4	The effects of power loss at key points throughout takeoff and climb out
	137.IV.G.K5	The effects of jettisoning a load of dry material as opposed to liquid materials
	137.IV.G.K6	Manufacturer recommended speeds and procedures for takeoff emergencies
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IV.G.R1	Recognizes risks associated with emergency jettison of load at too slow or too high an airspeed
	137.IV.G.R2	Recognizes the safest direction to go in an emergency for the pilot as well as people or property on the ground
	137.IV.G.R3	Identify key points on the runway for aborting the takeoff and or jettisoning of the load
	137.IV.G.R4	The emergency checklists and procedures that need to be memorized for takeoff emergencies
Skills	The applicant demonstrates the ability to:	
	137.IV.G.S1	Jettison a load either all at once or in part (if applicable)
	137.IV.G.S2	Maneuver the aircraft in a safe manner away from additional threats
	137.IV.G.S3	Demonstrate the proper procedure for various emergencies as applicable

137.IV.H External Load Operations (RW)

Task	Explain and demonstrate operational considerations for external load operations. (RW)
References	14 CFR Part 133; AFM/POH; AC 133-1B; AC 137-1B; FAA-H-8083-21B; NAAA-POG
Objective	Explain and demonstrate safe operating procedures for external load work.
Knowledge	The applicant demonstrates an understanding of: **137.IV.H.K1** Installation location of bucket controls on the cyclic: (a) Operation of emergency releases (b) Gate/plunger operation (c) Engine stop (d) Confirm cyclic balancing and control interference after additional controls are attached **137.IV.H.K2** Proper assurance of hook conformity to hour/calendar overhaul limits, and installation **137.IV.H.K3** Proper checks of bucket operation and installation prior to use **137.IV.H.K4** Proper preflight checks of external load hook **137.IV.H.K5** Proper mirror orientation to maximize view if applicable **137.IV.H.K6** Static dissipation procedures if applicable **137.IV.H.K7** Appropriate take off weights with an external load **137.IV.H.K8** Emergency procedures specific to external load applications **137.IV.H.K9** Proper PPE and safety equipment
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IV.H.R1** Proper landing zone (LZ) selection and orientation of approach and departure paths based on anticipated wind direction **137.IV.H.R2** Proper crew briefing of loading safety procedures including fueling procedures and communication procedures **137.IV.H.R3** Emergency procedures specific to external load operations **137.IV.H.R4** Dynamic rollover induced by dragging or tipping the bucket **137.IV.H.R5** Weight and balance considerations for external load operations **137.IV.H.R6** Considerations of density altitude for external load operations **137.IV.H.R7** PPE to include safety equipment specific to external load operations **137.IV.H.R8** Equipment clothing and container security at the LZ and loading area **137.IV.H.R9** Proper turning techniques to ensure accurate lines and efficient turns **137.IV.H.R10** Environmental hazards of flying with the doors off, if applicable

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Skills	The applicant demonstrates the ability to:	
	137.IV.H.S1	Conduct a thorough and effective crew briefing prior to conducting external load operations
	137.IV.H.S2	Properly hook up to and pick up an external load at operational weights without tipping to avoid dynamic rollover and executing a smooth transition through effective translational lift (ETL)
	137.IV.H.S3	Setting down a bucket at operational weights without tipping to avoid dynamic rollover
	137.IV.H.S4	Maneuver the aircraft to ensure continuous cable tension
	137.IV.H.S5	Maneuver the aircraft to minimize bucket swing during operations
	137.IV.H.S6	Explain emergency procedures including but not limited to engine failure in a hover, and emergency jettison of the external load
	137.IV.H.S7	Demonstrate the ability to set the bucket on the ground and touching down behind the bucket without pinching or damaging cables

137.IV.I Platform (Truck) and Confined Area Loading and Takeoff (RW)

Task	Explain and demonstrate operational considerations specific to platform (i.e. truck), and confined area loading.	
References	AFM/POH; AC 137-1B; FAA-H-8083-21B; NAAA-POG	
Objective	Explain and demonstrate safe operating procedures for platform and confined area loading (if applicable)	
Knowledge	The applicant demonstrates an understanding of:	
	137.IV.I.K1	Appropriate placement and alignment of the platform landing zone
	137.IV.I.K2	Procedures for ensuring proper managing of loading hoses and equipment
	137.IV.I.K3	The susceptibility and effects of loss of tail-rotor effectiveness (LTE) and how to prevent it
	137.IV.I.K4	The susceptibility and effects of flying slower than ETL and how to use a height velocity chart to avoid it
	137.IV.I.K5	The susceptibility and effects of Dynamic Rollover and how to prevent it
	137.IV.I.K6	Weight and balance considerations of operation from a platform or confined area
	137.IV.I.K7	The effects of different surfaces and surface cover on the effectiveness of ground effect
	137.IV.I.K8	Additional inspection and maintenance of platform and loading equipment
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IV.I.R1	Situational awareness of ETL, as well as mitigation techniques and strategies
	137.IV.I.R2	Proper brownout condition avoidance on takeoff during dusty conditions
	137.IV.I.R3	Preflight planning for hose and loading equipment connection and disconnection
	137.IV.I.R4	Proper procedure to ensure container, loading supplies and/or equipment security prior to operations on the platform
	137.IV.I.R5	Avoiding overweight and out of balance conditions, including lateral balance
	137.IV.I.R6	Ground crew awareness of proper orientation and setup of landing and loading area and/or equipment
	137.IV.I.R7	The potential risks of operating from an unsafe operating surface or structure

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Skills	The applicant demonstrates the ability to:	
	137.IV.I.S1	Effectively avoid loss of tail rotor effectiveness (ETL) and explain what to do if it is experienced
	137.IV.I.S2	Ensures that all loading equipment is disconnected prior to takeoff
	137.IV.I.S3	Ensures that all equipment, containers, PPE, and other items are secured an/or properly stored prior to takeoff
	137.IV.I.S4	Safely performs a takeoff at operational weights from an elevated platform and/or a confined area by following manufacturers recommended procedures to include the height/velocity profile
	137.IV.I.S5	Performs a takeoff at normal operating weights from an elevated platform and/or a confined area where pilot control of the aircraft is never in question

137.V Ferry and Approach to the Working Area

137.V.A In-Flight Hazards for Ferrying

Task	Recognizing and Responding to Flight-path Hazards	
References	14 CFR Part 91: §91.119; 14 CFR Part 137: §137.49; AC 61-134 and other FAA CFIT documents as applicable; AC 137-1B; National Aerial Applicator's Manual; NAAA-POG; Sectional Charts and other maps as appropriate	
Objective	Determine that the applicant understands ferry flight routing and the potential hazards of obstructions, hazards, sensitive areas, and congested areas along the path of ferry flight.	
Knowledge	The applicant demonstrates an understanding of:	
	137.V.A.K1	The appropriate minimum altitude for ferrying to and from the application target area
	137.V.A.K2	Local terrain and other obstructions and hazards to ferry flight
	137.V.A.K3	The appropriate flight path to avoid overflight of sensitive or congested areas
	137.V.A.K4	Sources of information about hazards in unfamiliar areas
	137.V.A.K5	Actions required due to the presence of flight-path hazards: (a) Powerlines / Poles (b) Guy Wires (c) Congested areas (d) Towers (e) Wind turbines (f) Other obstacles
	137.V.A.K6	Special use airspace, TFRs, and/or other airspace considerations for ferry flight
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.V.A.R1	Ferry flight planning at or above 500ft AGL in accordance with 91.119
	137.V.A.R2	Ferry flight route planning that avoids congested areas
	137.V.A.R3	Ferry flight route planning that avoids sensitive areas, obstructions, towers, high terrain, and other hazards
	137.V.A.R4	Ferry flight route diversion to avoid interfering with other aircraft
	137.V.A.R5	Alternate landing zones, safe load dump locations, and contingencies for emergencies during ferry flight
Skills	The applicant demonstrates the ability to:	
	137.V.A.S1	Obtain and interpret information about flight-path hazards
	137.V.A.S2	Recognize and plan to avoid flight-path hazards

137.V.B Current Weather En-Route and at Target Site

Task	En-route weather and target site weather	
References	14 CFR Part 91; FAA-H-8083-28; AIM; A Pilot's Guide to Aviation Weather Services; National Aerial Applicator's Manual; NAAA-POG; Current weather observations and forecasts	
Objective	Determine that the applicant understands meteorology that may affect Part 137 operations, weather services available in-flight, and other methods of determining weather in flight and at the application target.	
Knowledge	The applicant demonstrates an understanding of:	
	137.V.B.K1	Weather sources available both preflight and en-route
	137.V.B.K2	Interpreting relevant weather sources in flight
	137.V.B.K3	Local weather patterns and their potential hazard to flight and application
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.V.B.R1	Personal weather minimums for safety of flight and safety of applications
	137.V.B.R2	Uses available equipment and weather sources to monitor weather conditions in flight, compare to predictions, and determine trends that may affect application or flight safety
Skills	The applicant demonstrates the ability to:	
	137.V.B.S1	Access and interpret weather information available in-flight
	137.V.B.S2	Make accurate assessments of current conditions by use of a smoke generating device, or an on-board meteorological measurement system (if available)
	137.V.B.S3	Make accurate assessments of current conditions by observation of the environment

137.V.C Working Area Assessment

Task	Airborne Field Assessment	
References	AC 61-134; NAAA-POG; National Aerial Applicator's Manual	
Objective	The applicant will be able to accurately assess a job site, explain and/or demonstrate why a flight pattern was selected for a specific target field application.	
Knowledge	The applicant demonstrates an understanding of:	
	137.V.C.K1	Consideration of operational hazards: (a) In field (b) At or along field boundaries (c) Obstructions and hazards in the turn area
	137.V.C.K2	Crop orientation and its effect on pattern selection
	137.V.C.K3	The need for a current meteorological assessment of the application site
	137.V.C.K4	The tools available to conduct the meteorological assessment
	137.V.C.K5	Appropriate techniques and/or equipment use to scan for other aircraft
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.V.C.R1	CFIT awareness and avoidance
	137.V.C.R2	The effect of weather on application operations
	137.V.C.R3	The effect of weather on product after it is dispersed from the aircraft
	137.V.C.R4	Potential sensitive sites near the job site
	137.V.C.R5	Possible emergency sites for load dumping, emergency landing, or lost link areas
	137.V.C.R6	Techniques and equipment to use while working around other Part 137 operations
Skills	The applicant demonstrates the ability to:	
	137.V.C.S1	Follow procedures to assess the working area at a safe altitude
	137.V.C.S2	Develop a plan to safely conduct application operations
	137.V.C.S3	Use aircraft equipment to conduct a meteorological assessment
	137.V.C.S4	Use other visual tools available to assist with meteorological assessment
	137.V.C.S5	Adequately scan and plan to avoid other traffic in the area

137.V.D Geography

Task	Understanding Geography and its effect on Part 137 operations	
References	AC 61-134; Sectional charts and other maps as appropriate; NAAA-POG	
Objective	The applicant will demonstrate understanding on how terrain and other geographical features effects aerial application	
Knowledge	The applicant demonstrates an understanding of:	
	137.V.D.K1	How to find and accurately assess terrain prior to flight
	137.V.D.K2	How to assess terrain upon arrival at the field
	137.V.D.K3	Strategies for making applications in uneven terrain
	137.V.D.K4	Other local meteorological effects that are caused by geographical features
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.V.D.R1	Reducing loads when working in areas when aircraft performance will be lacking
	137.V.D.R2	Setting up fields in a manner that will minimize risks and other adverse terrain effects
	137.V.D.R3	Making go/no-go decisions based on density altitude or wind that will be conducive to a safe application
Skills	The applicant demonstrates the ability to:	
	137.V.D.S1	Accurately assess an application site and its surrounding area for geographical features that can affect 137 operations
	137.V.D.S2	Develop a strategy to safely and effectively conduct the application

137.V.E Sensitive Sites Near or in the Field

Task	Sensitive sites near or in the field	
References	AC 137-1B; Applicable Pesticide Label; National Aerial Applicator's Manual; state local and tribal laws; websites and other means of identifying sensitive sites; NAAA-POG;	
Objective	The applicant will demonstrate the ability to identify and avoid sensitive sites near or in the field	
Knowledge	The applicant demonstrates an understanding of:	
	137.V.E.K1	The sources available to determine sensitive sites
	137.V.E.K2	The potential harmful effects of a misapplication to sensitive sites for the products
	137.V.E.K3	Factors that can lead to off target deposition
	137.V.E.K4	Knowledge of specific local sensitive sites
	137.V.E.K5	The impacts of different products being applied to sensitive areas
	137.V.E.K6	Understands different types of sensitive sites including but not limited to, dwellings, humans, livestock, threatened and endangered species, pollinators, water, and various crops
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.V.E.R1	The proper use of wind, buffer zones, and other drift mitigation techniques to avoid misapplication to sensitive sites
	137.V.E.R2	Avoidance techniques for dwellings, occupied buildings or areas containing sensitive individuals, and/or livestock
	137.V.E.R3	Utilization of multiple sources of information to identify sensitive sites
	137.V.E.R4	Communication techniques for appropriate parties prior to application to remove the risk of applying near or on a sensitive site
Skills	The applicant demonstrates the ability to:	
	137.V.E.S1	Identify application timing that can avoid issues associated with sensitive sites
	137.V.E.S2	Select and utilize drift mitigation techniques to avoid application to sensitive sites
	137.V.E.S3	Identify and avoid flyovers of dwellings, occupied buildings, or areas containing sensitive individuals and/or livestock
	137.V.E.S4	Use sources available to identify sensitive sites prior to flight
	137.V.E.S5	Demonstrate and/or explain the methods and tools used to communicate to people regarding sensitive sites
	137.V.E.S6	Explain what factors can constitute a sensitive area

137.VI Emergency Procedure Considerations

137.VI.A Jettison a Load

Task	Recognize hazards associated with load jettison to persons or property and recognize the possible changes in flight characteristics when dumping a load.	
References	14 CFR Part 137: §137.53(c)(2); CAM 8: 10-3(e)(1); AFM/POH; STC requirements if applicable; NAAA-POG	
Objective	Determine that the applicant is aware of when a load should be jettisoned and what changes occur, if any, that could affect safety of flight.	
Knowledge	The applicant demonstrates an understanding of:	
	137.VI.A.K1	The flight control inputs required to safely accomplish the flight while jettisoning a load
	137.VI.A.K2	Potential impacts to people or property depending on where the load is jettisoned if options exist
	137.VI.A.K3	When a jettison needs to be reported to state officials as a spill
	137.VI.A.K4	Aircraft specific limits and procedures relative to load
	137.VI.A.K5	The aerodynamic changes and effects of rapidly changing aircraft weight
	137.VI.A.K6	The effect of various airspeeds on aircraft stability and control during a jettison
	137.VI.A.K7	The scenarios requiring an emergency jettison vs. a precautionary jettison
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VI.A.R1	Rapid CG and aerodynamic changes post jettison
	137.VI.A.R2	Proper site selection to minimize post jettison effects
	137.VI.A.R3	Appropriate speed and configuration selection prior to a precautionary jettison
Skills	The applicant demonstrates the ability to:	
	137.VI.A.S1	Safely jettison a load or partial load as required
	137.VI.A.S2	Anticipate aircraft pitch and stability while performing a jettison and apply the correct control inputs throughout the maneuver to avoid loss of control
	137.VI.A.S3	Explain any reporting requirements in the event of load jettison

137.VI.B Landing with a Load

Task	Recognize the hazards associated with landing an aircraft with a load	
References	14 CFR Part 91: §91.103(b); AFM/POH; NAAA-POG	
Objective	Determine that the applicant understands the aircraft limitations of landing with a load and can explain and/or execute the actions required to safely land with a load	
Knowledge	The applicant demonstrates an understanding of:	
	137.VI.B.K1	A max landing weight for the aircraft being flown
	137.VI.B.K2	Runway requirements for landing the loaded aircraft
	137.VI.B.K3	Effects of wind, density altitude and other environmental factors on landing with a load
	137.VI.B.K4	Procedures for getting the aircraft light enough to meet a max landing weight if one exists
	137.VI.B.K5	Safe approach speed for this aircraft when loaded at max landing weight
	137.VI.B.K6	Emergency planning to unload the aircraft safely if the landing cannot be made at the home base
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VI.B.R1	Certified maximum landing weight and stalls on short final
	137.VI.B.R2	Certified maximum landing weight and runway overrun
	137.VI.B.R3	Aircraft specific engine and energy management during approach to landing with a load
	137.VI.B.R4	The effect of using beta during landing on controllability (if applicable)
Skills	The applicant demonstrates the ability to:	
	137.VI.B.S1	Identify the aircraft maximum landing weight
	137.VI.B.S2	Identify and explain procedures for landing an aircraft at maximum landing weight
	137.VI.B.S3	Successfully execute a landing with a partial load if it is determined that it can be demonstrated safely with aircraft and pilot capabilities taken into consideration

137.VI.C Evaluating Damage in Flight

Task	Evaluating Damage in Flight	
References	AFM/POH; Other equipment documentation; Airworthiness Directives and Service bulletins as applicable	
Objective	Determine that the applicant understands the basic steps for evaluating aircraft damage in flight and determining the appropriate measures to execute a safe landing.	
Knowledge	The applicant demonstrates an understanding of:	
	137.VI.C.K1	The importance of maintaining control, if possible, after collision, damage, or failure
	137.VI.C.K2	The importance of remaining calm in the event of a collision, damage or failure
	137.VI.C.K3	A detailed understanding of aircraft systems, controls, and structures
	137.VI.C.K4	Aircraft performance under normal circumstances including but not limited to the intentional jettison of a load
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VI.C.R1	Appropriate airspeeds in the event of in-flight damage or failure
	137.VI.C.R2	Appropriate procedures to evaluate damage or failures in flight
	137.VI.C.R3	Use of small intentional control inputs to evaluate the controllability of the aircraft
	137.VI.C.R4	Use of preselected landing areas or runways and the first responders available nearby if needed
	137.VI.C.R5	The need to practice train and think through various failures or damages and what appropriate actions may lead to a favorable outcome
Skills	The applicant demonstrates the ability to:	
	137.VI.C.S1	Maintain situational awareness with relation to the preselected areas or runways to be used in the event of an emergency
	137.VI.C.S2	Demonstrate in a simulator or explain the correct steps to take for a scenario(s) where in-flight damage or failure occurs

137.VI.D AFM/POH Emergency Procedures Specific to the Aircraft Being Flown

Task	Understand the various emergency procedures in the AFM/POH.	
References	AFM/POH	
Objective	Determine that the applicant can identify the various emergency procedures and explain the appropriate actions to be taken for these emergencies	
Knowledge	The applicant demonstrates an understanding of:	
	137.VI.D.K1	The emergency procedures section of the AFM/POH
	137.VI.D.K2	The difference between "Land As Soon As Possible" and "Land As Soon As Practicable"
	137.VI.D.K3	The emergency flows or memory items specific to the aircraft being used for the test
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VI.D.R1	Periodic study of the emergency procedures section of the AFM/POH and practicing emergency flows and/or memory items
	137.VI.D.R2	Availability of AFM/POH emergency checklists in the cockpit
	137.VI.D.R3	Performance of a thorough preflight inspection using a checklist
Skills	The applicant demonstrates the ability to:	
	137.VI.D.S1	Identify an emergency
	137.VI.D.S2	Locate the appropriate emergency checklist
	137.VI.D.S3	Apply the appropriate emergency procedure for a given emergency

137.VI.E Selecting Emergency Landing Sites Nearby the Work Area

Task	Selecting Emergency Landing Sites Nearby the Work Area	
References	14 CFR Part 91: §91.3; National Aerial Applicator's Manual	
Objective	Determine that the applicant can identify potential emergency landing sites near the application site	
Knowledge	The applicant demonstrates an understanding of:	
	137.VI.E.K1	Required reaction time in the event of required emergency landing
	137.VI.E.K2	The recommended procedures for an emergency landing
	137.VI.E.K3	Short or soft field landing procedures and capabilities of the aircraft and pilot
	137.VI.E.K4	The effect of various forms of vegetation to the aircraft in the landing area
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VI.E.R1	Selection of emergency landing sites near the application area
	137.VI.E.R2	Selection of emergency landing sites within glide distance from various points in the application field
	137.VI.E.R3	Selection of emergency landing sites that can satisfy the performance needs of the aircraft and pilot
Skills	The applicant demonstrates the ability to:	
	137.VI.E.S1	Plan an application with emergency landing areas in mind
	137.VI.E.S2	Explain differences in suitable landing areas and various forms of surface conditions, and vegetation on emergency landing sites
	137.VI.E.S3	Explain and discuss the performance capabilities of the pilot and aircraft relative to emergency landing sites for a given scenario

137.VII Application

137.VII.A Determination of Flight Pattern

Task	Determination of Flight Pattern
References	AC 137-1B; National Aerial Applicator's Manual; NAAA-POG
Objective	The applicant will be able to explain and/or demonstrate proper flight pattern selection for a specific application.
Knowledge	The applicant demonstrates an understanding of: **137.VII.A.K1** The most professional way to perform an application **137.VII.A.K2** Why a particular application flight pattern is to be flown with considerations such as: (a) Meteorology (b) Field shape (c) Terrain/Topography (d) Crop row alignment (e) Adjacent crops (f) Adjacent livestock areas (g) Obstructions (h) Occupied structures (i) Observers (j) Nearby workers (k) Other people in the vicinity (l) Other factors
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VII.A.R1** Effective and safe flight pattern selection **137.VII.A.R2** Effective and safe flight pattern selection with regards to neighboring property and people **137.VII.A.R3** Situational awareness during application and potential alternate flight patterns
Skills	The applicant demonstrates the ability to: **137.VII.A.S1** Plan and implement a flight pattern for an aerial application to a particular target **137.VII.A.S2** Verbally explain multiple scenarios which would require using different flight patterns

137.VII.B Making Safe Turnarounds (FW)

Task	Making Safe Turnarounds
References	14 CFR Part 137: §137.19(e)(2)(v); AFM/POH; AC 120-109A; AC 137-1B; FAA-H-8083-3C; FAA-H-8083-25B; NAAA-POG; Air Tractor Turn Smart Video
Objective	Determine that the applicant understands the factors leading to stall/spin and CFIT dangers while performing a turnaround between spray passes. Determine that the applicant understands stall/spin avoidance and recovery techniques.
Knowledge	The applicant demonstrates an understanding of:
	137.VII.B.K1 Aircraft weight effects on maximum load factor and its relationship to the critical angle of attack
	137.VII.B.K2 Aerodynamic effects of various bank angles and risk of accelerated stall
	137.VII.B.K3 The effects of wind velocity and direction on turning radius
	137.VII.B.K4 Density altitude and its relation to CFIT risks
	137.VII.B.K5 Effects of uncoordinated flight at the onset of a stall
	137.VII.B.K6 The turning effects from the engine and propeller and its effect on coordinated flight at high angles of attack
	137.VII.B.K7 Incipient stall/spin recognition, and avoidance
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:
	137.VII.B.R1 Required load adjustment based on density altitude, wind and other meteorological conditions
	137.VII.B.R2 Impact of terrain, obstructions, or sensitive areas on performing a safe turnaround
	137.VII.B.R3 Aggressive turn avoidance
	137.VII.B.R4 Energy and airspeed management based on the aircraft's performance capabilities throughout the application
	137.VII.B.R5 Proper turn-around/go-around decision making in regards to the flight path
	137.VII.B.R6 Proper turn-around/go-around decision making as regards the next swath run
Skills	The applicant demonstrates the ability to:
	137.VII.B.S1 Demonstrate safe and accurate turnarounds while lining up for swath runs
	137.VII.B.S2 Conduct a turnaround with sufficient time and distance throughout the turn that does not lead to the need for aggressive or uncoordinated maneuvering
	137.VII.B.S3 Maintain a safe airspeed, attitude, and angle of attack throughout the turnaround
	137.VII.B.S4 Describes stall/spin recovery procedures

137.VII.C Swath Alignment

Task	Swath Alignment
References	14 CFR Part 137: 137.19(e)(2)(v); AFM/POH; AC 120-109A; AC 137-1B; FAA-H-8083-3C; FAA-H-8083-25B; NAAA-POG; Air Tractor Turn Smart Video
Objective	Determine that the applicant understands techniques to establish the precise desired path across the working area and maintain directional control to maintain this path.
Knowledge	The applicant demonstrates an understanding of:
	137.VII.C.K1 Effects of wind on ground track at working altitudes
	137.VII.C.K2 Importance of maintaining precise control of ground track
	137.VII.C.K3 Indications, sensitivity, and verification of the DGPS guidance system
	137.VII.C.K4 Sensitivity of heading and wind correction angle to ground track
	137.VII.C.K5 Working knowledge of guidance aides installed on the aircraft
	137.VII.C.K6 Techniques for correcting for deviations of desired ground track
	137.VII.C.K7 The effective swath width and overlap of the aircraft to be used
	137.VII.C.K8 Techniques for spraying around in-field obstacle obstacles along the swath run
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:
	137.VII.C.R1 Personal maximum deviation to ground track and aborting the pass if limits are exceeded
	137.VII.C.R2 Choosing a point on the horizon to follow in case guidance is lost
	137.VII.C.R3 Fixation avoidance and dividing attention between guidance indications and visual references
	137.VII.C.R4 Situational awareness with regards to terrain, obstacles, sensitive areas, and other hazards during swath run
	137.VII.C.R5 Good judgment and technique selection to avoid in-field obstacles along the swath run
	137.VII.C.R6 Maintenance of adequate wing/rotor/boom tip clearance from obstacles and from the ground while at low altitude in a swath run
Skills	The applicant demonstrates the ability to:
	137.VII.C.S1 Acquire and maintain desired ground track within acceptable limits
	137.VII.C.S2 Abort a swath run and re-enter the working area on the same pass, restarting application at or before the previous cutoff point
	137.VII.C.S3 Effectively use guidance system to maintain consistent and accurate ground track
	137.VII.C.S4 Effectively and safely work around real or simulated obstacle along the desired ground track in a swath run

137.VII.D Turnaraound Techniques (RW)

Task	Turnaround Techniques (RW)
References	AFM/POH; AC 137-1B; FAA-H-8083-21B; NAAA-POG; FAA-H-8083-21B: Chapter 11
Objective	Determine that the applicant understands the factors leading to Vortex Ring State and CFIT dangers while performing a turnaround between spray passes.
Knowledge	The applicant demonstrates an understanding of: **137.VII.D.K1** The coordinated flight control inputs necessary to conduct a smooth turn **137.VII.D.K2** The Height/Velocity curve and how it could come into play in a turnaround **137.VII.D.K3** Vortex Ring State (settling with power) recognition, avoidance, and recovery using both traditional and Vuichard procedures **137.VII.D.K4** Density altitude and its relation to CFIT risks
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VII.D.R1** The risks associated with flying uncoordinated during a turnaround **137.VII.D.R2** The risks associated with flying in the unsafe region of the Height Velocity curve **137.VII.D.R3** The risks associated with Vortex Ring state and how to avoid it **137.VII.D.R4** Terrain, obstructions, or sensitive areas and their impact on performing a safe turnaround **137.VII.D.R5** Load adjustment based on terrain, density altitude, wind, and other conditions **137.VII.D.R6** Proper turn-around/go-around decision making to avoid aggressive or uncoordinated maneuvering to line up for the swath run
Skills	The applicant demonstrates the ability to: **137.VII.D.S1** Conduct safe and accurate turnarounds at operational loads while lining up for swath runs **137.VII.D.S2** Conduct a turnaround at operational loads with sufficient time and distance throughout the turn that does not lead to the need for aggressive or uncoordinated maneuvering **137.VII.D.S3** Maintain a safe airspeed, attitude, and altitude throughout the turnaround **137.VII.D.S4** Describe and/or demonstrate how to recover from Vortex Ring State using FAA recommended procedures

137.VII.E Rapid Deceleration / Quick-Stops (RW)

Task	Rapid Deceleration / Quick-Stops (RW)	
References	AFM/POH; AC 137-1B; FAA-H-8083-21B	
Objective	The applicant will be able to explain and demonstrate the ability to conduct a quick stop or rapid deceleration	
Knowledge	The applicant demonstrates an understanding of:	
	137.VII.E.K1	The correct entry altitude to ensure tail rotor clearance
	137.VII.E.K2	The manufacturers maximum safe hovering altitude for the aircraft being flown
	137.VII.E.K3	The coordination of flight controls that is necessary to perform the maneuver correctly
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.E.R1	The risks associated with improper RPM and/or torque control
	137.VII.E.R2	The risks associated with attempting to complete the maneuver at the improper altitude
Skills	The applicant demonstrates the ability to:	
	137.VII.E.S1	Maintain RPM and torque within normal limits throughout the maneuver
	137.VII.E.S2	Properly coordinate all controls throughout the execution of the maneuver
	137.VII.E.S3	Maintain an altitude that will permit safe clearance between the tail boom and the surface
	137.VII.E.S4	Decelerates and terminates in a stationary hover at the recommended hovering altitude
	137.VII.E.S5	Maintains heading throughout the maneuver, $\pm 5^{\circ}$

137.VII.F Appropriate Working Altitudes

Task	Appropriate Working Altitudes	
References	14 CFR Part 91; Applicable Pesticide Label; AC 137-1B; NAAA-POGs; National Aerial Applicator's Manual	
Objective	The applicant will be able to explain and/or demonstrate the appropriate working altitude(s) for various types of aerial application jobs.	
Knowledge	The applicant demonstrates an understanding of:	
	137.VII.F.K1	The effect of excessive spray height
	137.VII.F.K2	The effect of inadequate spray height
	137.VII.F.K3	The optimum spray height for liquid applications
	137.VII.F.K4	The optimum spray height for dry (granular) applications
	137.VII.F.K5	The appropriate application height after taking terrain and other obstacles into account
	137.VII.F.K6	The appropriate operating altitudes for safe turnarounds with consideration of aircraft performance and external load altitude as applicable
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.F.R1	Determination of appropriate spray height to minimize off-target drift potential, maximize application efficacy, and take into account obstacles on or adjacent to the target area
Skills	The applicant demonstrates the ability to:	
	137.VII.F.S1	Select the appropriate altitude with the given aircraft setup
	137.VII.F.S2	Fly and maintain $(+10\%/-0\%)$ an appropriate application height for the given job
	137.VII.F.S3	Adequately plan application runs so that turning on and off the application equipment occurs at the correct altitude
	137.VII.F.S4	Plan application runs that will lead to smooth altitude transitions as required for obstructions on the target area and to avoid abrupt control movements that could lead to an excessive angle of attack
	137.VII.F.S5	Adequately plan application runs so that turning on and off the application equipment occurs at the correct altitude

137.VII.G Flare-Out, Turn On, Turn Off and Pull-Up

Task	Flare-Out, Turn On, Turn Off and Pull-Up
References	AFM/POH; FAA-H-8083-25B; National Aerial Applicator's Manual; NAAA-POG
Objective	Determine that the applicant understands the importance of, and performs, application turn on and turn off operations appropriately to keep the product in the target working area and mitigate potential off-target drift
Knowledge	The applicant demonstrates an understanding of:
	137.VII.G.K1 The effects of changes in angle of attack on aircraft vortices, droplet spectrum, and spray pattern
	137.VII.G.K2 The effects of abrupt changes in pressure on spray equipment, spray pattern and spray droplet spectrum
	137.VII.G.K3 The causes and effects of delay between opening spray valve or gate and the start of distribution of product on the target area, including "water hammer" and unvented airspace at the ends of the booms or other areas of the spray system
	137.VII.G.K4 The causes and effects of delay between closing the spray valve or gate and the end of product emerging from the aircraft
	137.VII.G.K5 The effects of using a pump valve brake to start/stop flow vs. use of the recirculating bypass valve (spray valve)
	137.VII.G.K6 The importance of "suck-back", how negative spray pressure is generated, and the effects and probable causes of incorrect negative spray pressure
	137.VII.G.K7 The effects of unvented airspace at the ends of the booms or other areas of the spray system "water hammer"
	137.VII.G.K8 The effects of "clumping" or foreign objects that may get stuck in the gate on the turn-off of dry product distribution and methods of detecting and clearing this situation
	137.VII.G.K9 The effects of wind gradient on airspeed and angle of attack when executing flare outs on field entry and pullups on field exit
	137.VII.G.K10 The effects of obstructions on wind at the field boundaries and the resulting effects on airspeed and angle of attack when executing flare outs on field entry and pullups on field exit

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Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.G.R1	Proper headland or dress pass planning, so that turn on and turn off are performed well inside the field without abrupt changes to angle of attack
	137.VII.G.R2	Energy management and planning techniques for appropriate field entry and exit airspeeds
	137.VII.G.R3	Energy management and planning techniques for appropriate field entry and exit airspeeds
	137.VII.G.R4	Avoidance of premature distribution of product before established at appropriate working altitude
	137.VII.G.R5	Avoidance of dragging product up out of the field behind aircraft
	137.VII.G.R6	Spray system technology usage such as negative boom pressure (suckback) to positively stop product distribution before pullup
	137.VII.G.R7	Equipment maintenance to prevent malfunctions and situations that may cause delayed shut-off
Skills	The applicant demonstrates the ability to:	
	137.VII.G.S1	Enter the working area with airspeed and approach angle appropriate to make a smooth and safe flare out at an appropriate working altitude
	137.VII.G.S2	Consistently start application of product as close to the edge of the field as appropriate but after flare out
	137.VII.G.S3	Consistently stop application as close to the edge of the field as appropriate at the working altitude but before beginning the pullup
	137.VII.G.S4	Exit the working area with sufficient airspeed to execute a smooth and safe pullup that safely clears any obstacles without abrupt changes to angle of attack
	137.VII.G.S5	Use appropriate rudder or tail rotor inputs to maintain directional control throughout all maneuvers

137.VII.H Obstructions

Task	Recognizing and Responding to Obstructions to flight both in swath run and in the turnaround
References	14 CFR Part 91: §91.119; 14 CFR Part 137: §137.49; AC 61-134; AC 137-1B; National Aerial Applicator's Manual; NAAA-POG
Objective	Determine that the applicant understands the potential hazards of obstructions and hazards to flight during the application
Knowledge	The applicant demonstrates an understanding of:

137.VII.H.K1 Appropriate application height

137.VII.H.K2 Entering and departing the working area over obstacles

137.VII.H.K3 Sources of information about hazards in unfamiliar areas

137.VII.H.K4 Actions required accommodating obstructions at the target field, field boundaries and in adjacent fields for the following obstacles:

(a) Powerlines / Poles
(b) Guy wires
(c) Houses
(d) Standpipes
(e) Irrigation equipment
(f) Towers
(g) Trees
(h) Wind turbines
(i) Other obstacles

137.VII.H.K5 Actions required due to the presence of flight-path hazards in or near the field with application operations underway for the following obstacles:

(a) Powerlines / Poles
(b) Guy wires
(c) Houses
(d) Standpipes
(e) Irrigation equipment
(f) Towers
(g) Trees
(h) Wind turbines
(i) Other obstacles

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Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.H.R1	Ferry flight planning at or above 500ft AGL
	137.VII.H.R2	Avoidance of abrupt flare outs and pullups
	137.VII.H.R3	Turnaround flight path planning to avoid obstructions, towers, high terrain, and other hazards
	137.VII.H.R4	Alternate landing zone, safe load dump location, and contingency planning for emergencies during application and turnarounds
	137.VII.H.R5	Preflight field survey, noting all obstacles and potential hazards
	137.VII.H.R6	Fixation and other common distraction avoidance and maintenance of situational awareness regarding the location of obstacles in or near the target site
Skills	The applicant demonstrates the ability to:	
	137.VII.H.S1	Identify obstacles and potential hazards in and near the working area
	137.VII.H.S2	Plan field entry and exit and working directions with regard to obstacles and potential hazards
	137.VII.H.S3	Avoid excessive and abrupt changes to angle of attack on flare out and pullup in the vicinity of obstacles and potential hazards
	137.VII.H.S4	Safely avoid obstacles while applying
	137.VII.H.S5	Keep wings level when necessary to avoid CFIT

137.VII.I Trim Passes (Cleanup, Headland, Dress Passes)

Task	Trim Passes (Cleanup, Headland, Dress Passes)	
References	National Aerial Applicator's Manual; NAAA-POG	
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with the necessity of, and techniques for, making trim passes when applying agricultural products	
Knowledge	The applicant demonstrates an understanding of:	
	137.VII.I.K1	The reasons for making trim passes
	137.VII.I.K2	Approximate number of trim passes required based on height of obstacles at end of normal passes
	137.VII.I.K3	The effects of, and usage of, technologies such as partial boom cutoffs to make precise edges without overspray or off-target application
	137.VII.I.K4	The "edge gap" caused when the pass next to the edge of the field is a partial swath width
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.I.R1	Special diligence for obstacles before entry to field for trim passes
	137.VII.I.R2	Observance of wind and environmental conditions with relation to possible sensitive areas near the working area
	137.VII.I.R3	The need for situational awareness and adequate field reconnaissance with trim passes in mind for CFIT avoidance
	137.VII.I.R4	The need to use trim passes to mitigate the risk of drift and ensure a uniform application
	137.VII.I.R5	The use of available technologies such as partial boom cutoffs to mitigate drift while doing trim passes
	137.VII.I.R6	Understanding guidance and mapping setup to properly interpret as applied maps and real time indications with regards to field edges
Skills	The applicant demonstrates the ability to:	
	137.VII.I.S1	Maintain situational awareness and properly mitigates CFIT risks
	137.VII.I.S2	Correctly estimate the number of trim passes on each end that are required for uniform coverage
	137.VII.I.S3	Reconfigure and use guidance system to make multiple trim passes with adequate coverage
	137.VII.I.S4	Uses available technologies such as partial boom cutoffs to make precise edges without overspray or off-target deposition on trim passes
	137.VII.I.S5	Fills in "edge gap pass" as required

137.VII.J Rinseout / Cleanout (Spray System Decontamination / Neutralization)

Task	Rinseout / Cleanout (Spray System Decontamination / Neutralization)	
References	Applicable Pesticide Label; AFM/POH; NAAA-POG; Food Safety/GAP audit if applicable; State or Tribal law if applicable	
Objective	Ensure the applicant understands the importance of rinse out/clean out from both a carry-over/contamination standpoint and a spray system maintenance standpoint	
Knowledge	The applicant demonstrates an understanding of:	
	137.VII.J.K1	Location of rinse out/clean out instructions on the product label and appropriate PPE needed for product handler
	137.VII.J.K2	Environmental hazards section of the product label and how that may apply to rinse out/clean out procedures
	137.VII.J.K3	Warning statements on the product label with regards to damage or corrosiveness to application equipment
	137.VII.J.K4	Any applicable instructions for rinse out/clean out per the AFM/POH or Supplements
	137.VII.J.K5	Dumping procedures for the aircraft to be flown if applicable
	137.VII.J.K6	The spray system/loading system and points that require special attention while rinsing out
	137.VII.J.K7	Appropriate use of cleaners or neutralizers to rinse out the spray system and appropriate PPE needed for the product handler
	137.VII.J.K8	Appropriate methods and sites for rinsate disposal
	137.VII.J.K9	Best practices for cleaning and rinsing loading system, spray system, and holding tanks
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.VII.J.R1	Awareness of product carryover or contamination to the next crop or area to be sprayed
	137.VII.J.R2	Awareness of product carryover or contamination of the spray system itself if not properly cleaned out
	137.VII.J.R3	Damage or corrosion or deterioration caused to parts of the spray system by some products
	137.VII.J.R4	Potential environmental risks associated with where and how a rinse out/clean out is conducted
	137.VII.J.R5	Risk associated with dumping if applicable
	137.VII.J.R6	Awareness of the risk of improper rinsate disposal
	137.VII.J.R7	The need to use appropriate PPE for handlers and applicators while rinsing, mixing and loading system, spray system, and holding tanks
	137.VII.J.R8	The need to take all aspects of rinse out/clean out procedures seriously to avoid complacency with regards to flight safety and product carry-over/contamination

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Skills	The applicant demonstrates the ability to:	
	137.VII.J.S1	Read and follow product label instructions
	137.VII.J.S2	Explain/carry out a rinse out/clean out plan specific to a product and an application area/rinsate disposal area that encompasses environmental, exposure, safety of flight, and professionalism concerns
	137.VII.J.S3	Explain/carry out a rinse out/clean out flight that encompasses virtually all aspects of this Task or:
	137.VII.J.S4	Explain/carry out an environmentally sound and professional method to rinse out/clean out on the ground that doesn't require a flight for this purpose

137.VIII Approach to the Airstrip Environment

137.VIII.A Current Weather

Task	Determine that the applicant can determine the current/updated weather conditions for an approach and landing
References	14 CFR Part 91: §91.155, §91.151; 14 CFR Part 137: §137.43; AFM/POH; FAA-H-8083-28; NAAA-POG
Objective	The applicant must be able to identify and explain weather minimums for VFR flight. The applicant must be able to find and interpret current/updated weather at the proposed landing site and find suitable alternate if required
Knowledge	The applicant demonstrates an understanding of: **137.VIII.A.K1** §91.155 Basic VFR weather minimums **137.VIII.A.K2** Effects of tailwind or crosswind on landing performance **137.VIII.A.K3** Max demonstrated crosswind velocity per AFM/POH **137.VIII.A.K4** Sources for current weather information **137.VIII.A.K5** Making visual references to estimate current weather conditions **137.VIII.A.K6** Recognizing trends in wind velocity and temperature/dew point spreads
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VIII.A.R1** The risks associated with continuing VFR to IMC conditions **137.VIII.A.R2** Landing with a tailwind or excessive crosswind **137.VIII.A.R3** Establishing personal minimums with regards to weather conditions at the landing site **137.VIII.A.R4** The need to have knowledge of possible alternates prior to departure **137.VIII.A.R5** The recency and validity of electronic weather sources
Skills	The applicant demonstrates the ability to: **137.VIII.A.S1** Identify weather threats to a safe and legal landing **137.VIII.A.S2** Plan and if necessary, execute a landing at an alternate location due to bad weather **137.VIII.A.S3** Correctly estimates conditions based on interpretation of visual references **137.VIII.A.S4** Receives and correctly interprets in flight sources of weather

137.VIII.B Radio Use

Task	Radio use in the landing airstrip environment
References	14 CFR Part 91: §91.129-91.131; 14 CFR Part 137: §137.43; AC 90-50D; AC 90-66C; FAA-P-8740-47; AIM: 4-2-1, 4-2-2, 4-1-9; FAA Pilot/Controller Glossary; NAAA-POG
Objective	Ensure the applicant understands, and is encouraged to use, radio communications in the vicinity of the landing airport; when radio use is and is not required; and procedures to use when operating without an aviation radio.
Knowledge	The applicant demonstrates an understanding of: **137.VIII.B.K1** Proper radio use and phraseology **137.VIII.B.K2** Advantages of features such as receiving Automatic Terminal Information Service (ATIS) or Automated Weather Observing System (AWOS) **137.VIII.B.K3** Communications requirements for class D, C, and B airspace **137.VIII.B.K4** Requirements for radio use for aircraft that have a communications radio installed **137.VIII.B.K5** Procedures for aircraft landing without a radio
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VIII.B.R1** The importance of using radio communication at public and private use airports **137.VIII.B.R2** Proper use of communication radio to obtain current weather **137.VIII.B.R3** The importance of using proper phraseology and terminology with radio communications **137.VIII.B.R4** Giving way to other aircraft when operating without communications radio
Skills	The applicant demonstrates the ability to: **137.VIII.B.S1** Properly communicate position reports when operating in the vicinity of an airport **137.VIII.B.S2** Use standard phraseology for efficient radio communications **137.VIII.B.S3** Understand and respond to light gun signals **137.VIII.B.S4** See and avoid other aircraft in a No-Radio situation **137.VIII.B.S5** Identify and select appropriate frequency for communication

137.VIII.C See and Avoid

Task	See and avoid procedures (VFR)
References	14 CFR Part 91: §91.3, §91.11, §91.113; 14 CFR Part 137: §137.43, §137.45; AC 90-48E; FAA-H-8083-3C; AIM: 4-3-3, 8-1-6; NAAA-POG
Objective	Determine that the applicant uses best practices for a visual scan and collision avoidance
Knowledge	The applicant demonstrates an understanding of: **137.VIII.C.K1** Traffic right of way rules and appropriate action to deconflict traffic concerns **137.VIII.C.K2** How eyes work with regard to scanning for traffic **137.VIII.C.K3** Effective scanning techniques **137.VIII.C.K4** Effective scanning techniques specific to night operations **137.VIII.C.K5** Electronic tools such as ADS-B to assist in traffic awareness and their capabilities and limitations **137.VIII.C.K6** Conditions where most midair or near midair collisions occur **137.VIII.C.K7** The time it takes to identify and react to traffic conflicts
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VIII.C.R1** Following standard traffic procedures in and around the airport **137.VIII.C.R2** Ferrying at a safe altitude that minimizes risks of midair collision **137.VIII.C.R3** Maintaining effective scanning techniques to mitigate midair collisions **137.VIII.C.R4** Making use of available electronic devices such as ADS-B and radio to enhance traffic awareness **137.VIII.C.R5** Clearly communicating with other aircraft to mitigate traffic conflicts **137.VIII.C.R6** The different techniques and skills needed for night vs. day operations regarding scanning for traffic (if applicable)
Skills	The applicant demonstrates the ability to: **137.VIII.C.S1** Identify and use appropriate traffic right of way rules and procedures **137.VIII.C.S2** Use appropriate airport traffic procedures **137.VIII.C.S3** Scan and identify traffic conflicts **137.VIII.C.S4** Explain or demonstrate ways to deconflict traffic for given scenarios **137.VIII.C.S5** Use installed electrical equipment (radio, ADS-B etc.) effectively and properly to detect and avoid traffic conflicts

137.VIII.D Traffic Pattern

Task	Traffic Pattern Requirements
References	14 CFR Part 91 §91.111, §91.113, §91.126, §91.131, §91.313; 14 CFR Part 107; 14 CFR Part 137 §137.43, §137.45; AFM/POH; AC 90-66C; FAA-H-8083-3C; FAA-H-8083-21B; FAA-H-8083-25B; AIM: 4-3-3; chart supplements (as applicable)
Objective	Ensure the applicant understands traffic pattern requirements and procedures
Knowledge	The applicant demonstrates an understanding of: **137.VIII.D.K1** A proper traffic pattern **137.VIII.D.K2** Requirements that must be met to deviate from a traffic pattern **137.VIII.D.K3** Aircraft right of way rules **137.VIII.D.K4** Proper traffic pattern entry procedures **137.VIII.D.K5** Aircraft checklists and other procedures **137.VIII.D.K6** Installed communication and other electronic devices used to avoid other traffic **137.VIII.D.K7** Knowledge of sensitive areas near the airport
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.VIII.D.R1** The need to see and avoid mitigating risks associated with midair collisions **137.VIII.D.R2** The use of non-standard traffic patterns to avoid sensitive areas **137.VIII.D.R3** The risks associated with not using a stabilized approach **137.VIII.D.R4** The risks association with improper checklist use **137.VIII.D.R5** Using electronic devices and communication equipment to avoid traffic conflicts **137.VIII.D.R6** Traffic avoidance procedures when deviating under §137.45 **137.VIII.D.R7** The need to avoid sensitive and potential sensitive areas near the airport
Skills	The applicant demonstrates the ability to: **137.VIII.D.S1** Identify and fly the appropriate traffic pattern at a given airport **137.VIII.D.S2** Describe safe approach and departure procedures for one-way (opposite direction) strips **137.VIII.D.S3** Uses available electronics, including communication equipment, properly **137.VIII.D.S4** Uses correct checklist or procedures prior to landing **137.VIII.D.S5** Establish a stabilized approach

137.IX Landing

137.IX.A Weather Considerations

Task	Weather Considerations for Landing	
References	14 CFR Part 91: §91.3, §91.103; AFM/POH; AC 60-22; AC 91-79B; FAA-H-8083-3C; FAA-H-8083-21B; FAA-H-8083-25B; FAA-H-8083-28	
Objective	The applicant demonstrates a thorough understanding of environmental factors affecting landing and demonstrates an ability to deal with adverse conditions at the landing area.	
Knowledge	The applicant demonstrates an understanding of:	
	137.IX.A.K1	AFM/POH published landing distance
	137.IX.A.K2	AFM/POH max demonstrated crosswind velocity
	137.IX.A.K3	What effect a wet or contaminated landing surface may have on safety
	137.IX.A.K4	What affect density altitude (DA) can have on aircraft performance with regards to landing
	137.IX.A.K5	Visual and other sources to evaluate landing weather conditions
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IX.A.R1	Setting personal minimums for weather conditions at the landing area
	137.IX.A.R2	Avoidance of unfavorable wind conditions when other options are available
	137.IX.A.R3	Using correct aircraft procedures and techniques to mitigate risks of landing on a wet or slippery surface
	137.IX.A.R4	High DA and its affect on aircraft performance when landing
	137.IX.A.R5	The need to assess visual and other sources to evaluate landing weather conditions
Skills	The applicant demonstrates the ability to:	
	137.IX.A.S1	Uses Aeronautical Decision Making to correctly assess the weather at the landing area and make appropriate adjustments
	137.IX.A.S2	Check weather at the time of landing
	137.IX.A.S3	Correctly interpret weather at the landing area (windsock, smoke etc.)
	137.IX.A.S4	Choose the appropriate landing area or runway with regards to wind direction
	137.IX.A.S5	Correctly evaluate and decide when a go-around or aborted landing is appropriate

137.IX.B Runway Considerations

Task	Ensure the applicant conducts preflight planning with regards to proposed landing runway surface and conditions
References	14 CFR Part 91: §91.3; AFM/POH; AC 91-79B
Objective	The applicant must reasonably determine, and explain why, a safe landing can be made on the proposed landing surface prior to takeoff.
Knowledge	The applicant demonstrates an understanding of: **137.IX.B.K1** The effect runway conditions can have on landing distance **137.IX.B.K2** The effect runway conditions may present to maintaining directional control
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IX.B.R1** Unstabilized approach **137.IX.B.R2** Runway length **137.IX.B.R3** Runway width **137.IX.B.R4** Runway surface **137.IX.B.R5** Runway slope **137.IX.B.R6** Potential obstructions near the runway
Skills	The applicant demonstrates the ability to: **137.IX.B.S1** Do proper pre-flight planning with regards to the proposed landing area

137.IX.C Go-Around and/or Rejected Landing

Task	Go-Around and/or Rejected Landing	
References	14 CFR Part 91: §91.3; AFM/POH; FAA-H-8083-3C; FAA-H-8083-23; AIM	
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a go-around/rejected landing with emphasis on factors that contribute to landing conditions that may require a go-around. The applicant should have set predetermined go around criteria SOP established, particularly on unimproved airstrips. Have applicant identify the predetermined criteria for a go around decision point	
Knowledge	The applicant demonstrates an understanding of:	
	137.IX.C.K1	Understand AFM/POH published landing distances
	137.IX.C.K2	Know the importance of a stabilized approach, to include energy management concepts
	137.IX.C.K3	Effects of atmospheric conditions, including wind and density altitude on a go-around or rejected landing
	137.IX.C.K4	Wind correction techniques on takeoff/departure and approach/landing
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IX.C.R1	Delayed recognition of the need for a go-around/rejected landing
	137.IX.C.R2	Delayed performance of a go-around at low altitude
	137.IX.C.R3	Improper application of power; spool up times for some engine types
	137.IX.C.R4	Improper airplane configuration
	137.IX.C.R5	Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife
	137.IX.C.R6	Low altitude maneuvering including, stall, spin, or CFIT
	137.IX.C.R7	Distractions, loss of situational awareness, or improper task management
	137.IX.C.R8	Short field landings
	137.IX.C.R9	Unimproved runway considerations

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Skills	The applicant demonstrates the ability to:	
	137.IX.C.S1	Identify go around criteria
	137.IX.C.S2	Complete the appropriate checklist
	137.IX.C.S3	Make radio calls as appropriate
	137.IX.C.S4	Make a timely decision to discontinue the approach to landing
	137.IX.C.S5	Apply takeoff power immediately and transition to climb pitch attitude for V_X or V_Y as appropriate ± 5 knots
	137.IX.C.S6	Configure the airplane after a positive rate of climb has been verified or in accordance with airplane manufacturer's instructions
	137.IX.C.S7	Maneuver to the side of the runway/landing area when necessary to clear and avoid conflicting traffic
	137.IX.C.S8	Maintain V_Y ± 5 knots to a safe maneuvering altitude
	137.IX.C.S9	Maintain directional control and proper wind-drift correction throughout the climb
	137.IX.C.S10	Explain a typical go around procedure for that aircraft

137.IX.D Normal Approach and Landing

Task	Normal Approach and Landing
References	AFM/POH; FAA-H-8083-2A; FAA-H-8083-3C; FAA-H-8083-23; AIM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a normal approach and landing with emphasis on proper use and coordination of flight controls. Note: If a crosswind condition does not exist, the applicant's knowledge of crosswind elements must be evaluated through oral testing.
Knowledge	The applicant demonstrates an understanding of: **137.IX.D.K1** A stabilized approach, to include energy management concepts **137.IX.D.K2** Effects of atmospheric conditions, including wind, on approach and landing performance **137.IX.D.K3** Wind correction techniques on approach and landing
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IX.D.R1** Selection of runway or approach path and touchdown area based on pilot capability, airplane performance and limitations, available distance, and wind **137.IX.D.R2** Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition **137.IX.D.R3** Planning for: (a) Go-around and rejected landing (b) Land and hold short operations (LAHSO) **137.IX.D.R4** Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, vessels, persons, and wildlife **137.IX.D.R5** Low altitude maneuvering including, stall, spin, or CFIT **137.IX.D.R6** Distractions, loss of situational awareness, incorrect airport surface approach and landing, or improper task management

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Skills The applicant demonstrates the ability to:

137.IX.D.S1	Complete the appropriate checklist
137.IX.D.S2	Make radio calls as appropriate
137.IX.D.S3	Ensure the aircraft is aligned with the correct/assigned runway or landing surface
137.IX.D.S4	Scan the runway or landing surface and adjoining area for traffic and obstructions
137.IX.D.S5	Select and aim for a suitable touchdown point considering the wind, landing surface, and obstructions
137.IX.D.S6	Establish the recommended approach and landing configuration and airspeed, and adjust pitch attitude and power as required to maintain a stabilized approach
137.IX.D.S7	Maintain manufacturer's published approach airspeed or in its absence not more than a minimum steady flight speed in the landing configuration of $1.3 \times V_{S_0} \pm 5$ knots (also denoted as V_{at} or V_{Ref}) with gust factor applied
137.IX.D.S8	Maintain directional control and appropriate crosswind correction throughout the approach and landing
137.IX.D.S9	Make smooth, timely, and correct control application during round out and touchdown
137.IX.D.S10	Touch down at a proper pitch attitude, within 200 feet beyond or on the specified point, with no side drift, and with the airplane's longitudinal axis aligned with and over the runway center/landing path
137.IX.D.S11	Execute a timely go-around if the approach cannot be made within the tolerances specified above or for any other condition that may result in an unsafe approach or landing
137.IX.D.S12	Utilize runway incursion avoidance procedures

137.IX.E Platform (Truck) and Confined Space Landing (RW)

Task	Platform (Truck) and Confined Space Landing (RW)	
References	AC 137-1B; FAA-H-8083-21B; NAAA-POG	
Objective	Explain and demonstrate safe operating procedures for platform loading and confined space landing (if applicable) to include slope landings.	
Knowledge	The applicant demonstrates an understanding of:	
	137.IX.E.K1	The need to select an appropriate placement and alignment of the platform
	137.IX.E.K2	How to evaluate obstacles near the landing zone or platform
	137.IX.E.K3	Mast bumping and dynamic rollover
	137.IX.E.K4	The importance of procedures for ensuring proper managing of loading hoses and equipment
	137.IX.E.K5	The susceptibility and effects of loss of tail-rotor effectiveness (LTE) and how to prevent it
	137.IX.E.K6	Additional inspection and maintenance of platform and loading equipment
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.IX.E.R1	Recognizing risks of LTE and developing a plan to avoid it
	137.IX.E.R2	Developing a procedure for identifying the direction of slope
	137.IX.E.R3	Developing a procedure to ensure containers and other loading supplies and/or equipment will be secured prior to landing operations on the platform
	137.IX.E.R4	Developing a procedure for ground crew to remain clear in the event of a landing accident or incident
	137.IX.E.R5	Considering obstacles when selecting and performing the approach and positioning of the landing zone or truck
	137.IX.E.R6	Considerations for excluding non-participating personnel and equipment from the landing zone
	137.IX.E.R7	Developing a procedure to ensure the platform or landing area is inspected and in safe condition prior to conducting operations
	137.IX.E.R8	Developing a procedure to recognize mast bumping and situations that could lead to dynamic rollover

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Skills	The applicant demonstrates the ability to:	
	137.IX.E.S1	Conduct proper reconnaissance of the landing zone and/or platform
	137.IX.E.S2	Select a suitable approach path, and termination point
	137.IX.E.S3	Track the selected approach path at an acceptable approach angle and rate of closure to the termination point
	137.IX.E.S4	Maintain RPM and/or torque within normal limits
	137.IX.E.S5	Avoid situations that can result in settling-with-power
	137.IX.E.S6	Perform a complete landing at operational loads on the platform or surface of the landing zone
	137.IX.E.S7	Correctly identify the slope of the landing zone and lands across the slope

137.IX.F Soft-Field Approach and Landing (FW)

Task	Soft-Field Approach and Landing (FW)
References	AFM/POH; FAA-H-8083-2A; FAA-H-8083-3C; AIM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a soft-field approach and landing with emphasis on proper use and coordination of flight controls.
Knowledge	The applicant demonstrates an understanding of: **137.IX.F.K1** A stabilized approach, to include energy management concepts **137.IX.F.K2** Effects of atmospheric conditions, including wind, on approach and landing performance **137.IX.F.K3** Wind correction techniques on approach and landing
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IX.F.R1** Selection of runway based on pilot capability, airplane performance and limitations, available distance, and wind **137.IX.F.R2** Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition **137.IX.F.R3** Planning for: (a) Go-around and rejected landing (b) Land and hold short operations (LAHSO) **137.IX.F.R4** Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, persons, and wildlife **137.IX.F.R5** Low altitude maneuvering including, stall, spin, or CFIT **137.IX.F.R6** Distractions, loss of situational awareness, or improper task management

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Skills The applicant demonstrates the ability to:

137.IX.F.S1	Complete the appropriate checklist
137.IX.F.S2	Make radio calls as appropriate
137.IX.F.S3	Ensure the airplane is aligned with the correct/assigned runway
137.IX.F.S4	Scan the landing runway and adjoining area for traffic and obstructions
137.IX.F.S5	Consider the wind conditions, landing surface, obstructions, and select and aim for a suitable touchdown point
137.IX.F.S6	Establish the recommended approach and landing configuration and airspeed, and adjust pitch attitude and power as required to maintain a stabilized approach
137.IX.F.S7	Maintain manufacturer's published approach airspeed or in its absence not more than $1.3 \times V_{S_0} \pm 5$ knots (also denoted as V_{at} or V_{Ref}) with gust factor applied
137.IX.F.S8	Maintain directional control and appropriate crosswind correction throughout the approach and landing
137.IX.F.S9	Make smooth, timely, and correct control inputs during the round out and touchdown, and, for tricycle gear airplanes, keep the nose wheel off the surface until loss of elevator effectiveness
137.IX.F.S10	Touch down at a proper pitch attitude with minimum sink rate, no side drift, and with the airplane's longitudinal axis aligned with the center of the runway
137.IX.F.S11	Maintain elevator as recommended by manufacturer during rollout and exit the "soft" area at a speed that would preclude sinking into the surface
137.IX.F.S12	Execute a timely go-around if the approach cannot be made within the tolerances specified above or for any other condition that may result in an unsafe approach or landing
137.IX.F.S13	Maintain proper position of the flight controls and sufficient speed to taxi while on the soft surface

137.IX.G Short-Field Approach and Landing (FW)

Task	Short-Field Approach and Landing (FW)
References	AFM/POH; FAA-H-8083-2A; FAA-H-8083-3C; AIM
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with a short-field approach and landing with emphasis on proper use and coordination of flight controls.
Knowledge	The applicant demonstrates an understanding of: **137.IX.G.K1** A stabilized approach, to include energy management concepts **137.IX.G.K2** Effects of atmospheric conditions, including wind, on approach and landing performance **137.IX.G.K3** Wind correction techniques on approach and landing
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.IX.G.R1** Selection of runway based on pilot capability, airplane performance and limitations, available distance, and wind **137.IX.G.R2** Effects of: (a) Crosswind (b) Windshear (c) Tailwind (d) Wake turbulence (e) Runway surface/condition **137.IX.G.R3** Planning for: (a) Go-around and rejected landing (b) Land and hold short operations (LAHSO) **137.IX.G.R4** Collision hazards, to include aircraft, terrain, obstacles, wires, vehicles, persons, and wildlife **137.IX.G.R5** Low altitude maneuvering including, stall, spin, or CFIT **137.IX.G.R6** Distractions, loss of situational awareness, or improper task management

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Skills	The applicant demonstrates the ability to:	
	137.IX.G.S1	Complete the appropriate checklist
	137.IX.G.S2	Make radio calls as appropriate
	137.IX.G.S3	Ensure the airplane is aligned with the correct/assigned runway
	137.IX.G.S4	Scan the landing runway and adjoining area for traffic and obstructions
	137.IX.G.S5	Select and aim for a suitable touchdown point considering the wind, landing surface, and obstructions
	137.IX.G.S6	Establish the recommended approach and landing configuration and airspeed, and adjust pitch attitude and power as required to maintain a stabilized approach
	137.IX.G.S7	Maintain manufacturer's published approach airspeed or in its absence not more than $1.3 \times V_{S_0} \pm 5$ knots (also denoted as V_{at} or V_{Ref}) with wind gust factor applied
	137.IX.G.S8	Maintain directional control and appropriate crosswind correction throughout the approach and landing
	137.IX.G.S9	Make smooth, timely, and correct control application during the round out and touchdown
	137.IX.G.S10	Touch down at a proper pitch attitude within 100 feet beyond or on the specified point, threshold markings, or runway numbers, with no side drift, minimum float, and with the airplane's longitudinal axis aligned with and over runway centerline
	137.IX.G.S11	Use manufacturer's recommended procedures for airplane configuration and braking
	137.IX.G.S12	Execute a timely go-around if the approach cannot be made within the tolerances specified above or for any other condition that may result in an unsafe approach or landing
	137.IX.G.S13	Utilize runway incursion avoidance procedures

137.X Post Application

137.X.A Grower Notification

Task	Grower Notification
References	WPS; NAAA-POG; State local or tribal law
Objective	Ensure that the applicant is aware of the WPS requirement to notify the grower of a pesticide application and product(s) applied
Knowledge	The applicant demonstrates an understanding of: **137.X.A.K1** WPS - How to Comply Manual with regards to posting and notification requirements
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.X.A.R1** Worker re-entry requirements into a treated site **137.X.A.R2** Ensuring required posting is accomplished
Skills	The applicant demonstrates the ability to: **137.X.A.S1** Describe grower notification requirements **137.X.A.S2** Describe a standard operating procedure to ensure the field has been posted if required

137.X.B Aircraft Postflight Inspection

Task	Postflight Inspection
References	AFM/POH; other appropriate inspection checklists as applicable
Objective	Ensure the applicant is aware of the safety margins that may be gained by doing a post flight aircraft inspection when the pressure to get the job done isn't present and there is ample time to address any issues uncovered during the post flight inspection.
Knowledge	The applicant demonstrates an understanding of: **137.X.B.K1** Use of AFM/POH to conduct an inspection at the end of the working day
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.X.B.R1** The lack of a proper aircraft and systems inspection **137.X.B.R2** It may be easier to identify where damage to an aircraft occurred immediately following the flight (e.g. bullet holes) **137.X.B.R3** Lack of post flight inspection as a contributing factor for Part 137 accidents and incidents that could have been avoided had a post flight inspection occur
Skills	The applicant demonstrates the ability to: **137.X.B.S1** Use of the AFM/POH to do a proper aircraft and systems preflight inspection.

137.X.C Disposition and Disposal of Application Residues and Containers

Task	Disposition and Disposal of Application Residues and Containers	
References	AC 137-1B; National Pesticide Applicator Manual; Applicable Pesticide Label	
Objective	The applicant will show knowledge of the procedure(s) specified and subsequently followed to dispose of emptied crop protection material containers.	
Knowledge	The applicant demonstrates an understanding of:	
	137.X.C.K1	Regulations or requirements for re-use of crop protection material containers
	137.X.C.K2	The regulatory requirements for disposal of crop unused protection material
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.X.C.R1	Proper procedure for removing and disposing of emptied crop protection material containers
Skills	The applicant demonstrates the ability to:	
	137.X.C.S1	Triple-rinse and properly dispose of emptied pesticide product container
	137.X.C.S2	Direct the proper disposal or disposition of empty containers
	137.X.C.S3	Direct the proper disposal or disposition of excess crop protection products, rinsate, and/ or partial containers

137.X.D Application Records

Task	Application Records
References	14 CFR Part 137; FAA Order 8900.1; WPS; Applicable Pesticide Label; Local State or Tribal Law
Objective	Ensure the applicant is aware of the application record requirements.
Knowledge	The applicant demonstrates an understanding of: **137.X.D.K1** Pesticide application requirements per WPS, FAA, State or tribal governing agencies **137.X.D.K2** Pilot record requirements per FAA and State or tribal governing agencies **137.X.D.K3** How long these records must be kept
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.X.D.R1** Liability of poor record keeping with regards to application issues to the site treated **137.X.D.R2** Liability of poor record keeping in the event of a complaint
Skills	The applicant demonstrates the ability to: **137.X.D.S1** Keep accurate and detailed records

137.XI Emergency Response

137.XI.A Emergency Response Plan

Task	Develop an Emergency Response Plan for Both Spills and Accidents
References	49 CFR Part 830; State and Local Laws Regarding Spills; NAAA-POG
Objective	Determine that the applicant knows what constitutes a reportable accident or incident. Determine that the applicant knows what constitutes a reportable spill.
Knowledge	The applicant demonstrates an understanding of:
	137.XI.A.K1 The following Sections of 49 CFR Part 830: (a) Subpart A - §830.2 (b) Subpart B - §830.5 and §830.6 (c) Subpart C - §830.10 (d) Subpart D - §830.15
	137.XI.A.K2 Reportable quantity of spills and who a spill must be reported to
	137.XI.A.K3 Has access to SDS and labels for products in that load/container or mix
	137.XI.A.K4 How to get in rapid contact with local fire department and EMS
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:
	137.XI.A.R1 The risk associated with aerial application with regards to all employees and the importance of complete and accurate employee records to use in the event of emergency
	137.XI.A.R2 The risk associated with pesticide application with regards to the environment and the importance of rapid release containment and cleanup
	137.XI.A.R3 Maintains spill/release cleanup tools and materials
	137.XI.A.R4 Maintains SDS and labels for products being mixed/applied and stored
Skills	The applicant demonstrates the ability to:
	137.XI.A.S1 Respond appropriately to local fire and EMS
	137.XI.A.S2 Respond appropriately to spill response hotline
	137.XI.A.S3 Maintains access to SDS and labeling for poison control and EMS
	137.XI.A.S4 Maintains emergency contact information for each employee
	137.XI.A.S5 Respond appropriately to FAA or NTSB

137.XI.B Chemical Exposure and Heat Exhaustion

Task	Emergency Procedures for Poisoning, Chemical Exposure or Heat Exhaustion	
References	Applicable Pesticide Label and SDS; WPS; Poison Centers; NPIC; Warning Signs of Heat-Related Illness	
Objective	The applicant describes typical symptoms of accidental poisoning vs heat exhaustion.	
Knowledge	The applicant demonstrates an understanding of:	
	137.XI.B.K1	Signs of acute poisoning
	137.XI.B.K2	Signs of chronic poisoning
	137.XI.B.K3	Procedures for getting treatment for poisoning
	137.XI.B.K4	Location of first aid statement on product labels
	137.XI.B.K5	Symptoms of heat cramps, heat exhaustion and heat stroke
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.XI.B.R1	The need to train personnel on the recognition of poisoning and heat exhaustion
	137.XI.B.R2	Correct procedures for getting a person treated after poisoning or heat exhaustion
	137.XI.B.R3	The need to have access to SDS and labels for applicable products
	137.XI.B.R4	The importance of treating heat exhaustion and chemical poisoning immediately
	137.XI.B.R5	The importance of maintaining a wash station and spare clothing
Skills	The applicant demonstrates the ability to:	
	137.XI.B.S1	Recognize a poisoning incident and take appropriate actions
	137.XI.B.S2	Locate and use the first aid statement in the event of a poisoning
	137.XI.B.S3	Train other workers in emergency poisoning response procedures
	137.XI.B.S4	Maintains product labels and SDS for medical response
	137.XI.B.S5	Explain symptoms of heat exhaustion and methods to treat heat exhaustion
	137.XI.B.S6	Explain key differences between heat exhaustion and chemical poisoning

137.XII Special Emphasis Areas

137.XII.A Controlled Flight Into Terrain (CFIT)

Task	Avoiding Controlled Flight Into Terrain (CFIT)
References	14 CFR Part 91: §91.155, §91.119; AC 61-134; FAA-H-8083-25B; FAA-H-8083-3C; FAA-H-8083-21B; AIM: 7-5-3; Current aeronautical charts as applicable; NOTAMS; NAAA-POG; NAAREF Wires and Obstructions Video and other items as applicable
Objective	To ensure the applicant understands the risk of CFIT and takes necessary precautions to avoid CFIT.
Knowledge	The applicant demonstrates an understanding of: **137.XII.A.K1** The prevalence of CFIT in Part 137 operations related to: (a) Weather (b) Terrain (c) Obstacles **137.XII.A.K2** Weather sources available to pilots for preflight and in flight **137.XII.A.K3** Indications that VMC changing to IMC could or is likely to happen **137.XII.A.K4** How to avoid VFR flight into IMC **137.XII.A.K5** How to properly conduct preapplication reconnaissance **137.XII.A.K6** Available electronic device use and how to use them in CFIT avoidance **137.XII.A.K7** Ensures that any installed obstacle detection and avoidance systems are in working order **137.XII.A.K8** Accurately interpret aeronautical charts and NOTAMs **137.XII.A.K9** Knowledge of any applicable local obstacle databases
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.XII.A.R1** Preflight and inflight weather monitoring with regards to deteriorating ceiling and visibility **137.XII.A.R2** How aircraft electronics and instrumentation could be used to safely land in the event of inadvertent penetration of IMC **137.XII.A.R3** Use of available electronics to maintain awareness of weather and its in-flight changes **137.XII.A.R4** Use of available electronics to maintain situational awareness of terrain and obstacles **137.XII.A.R5** Obstacle and terrain reconnaissance prior to and during operations **137.XII.A.R6** Planning application patterns to minimize the risk of CFIT with regards to obstacles or terrain

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Skills	The applicant demonstrates the ability to:	
	137.XII.A.S1	Conducts proper preflight planning with regards to weather
	137.XII.A.S2	Conduct and describe proper preapplication reconnaissance of the work area and route to and from
	137.XII.A.S3	Select and maintains a ferry altitude (if applicable) that ensures clearance from obstacles and compliance with §91.119
	137.XII.A.S4	Maintains situational awareness with regards to weather, terrain, and obstacles throughout the flight

137.XII.B Stall/Spin Awareness and Avoidance

Task	Stall/Spin Awareness and Avoidance
References	AFM/POH; AC 61-67C; FAA-H-8083-2A; FAA-H-8083-3C; NAAREF Stall/Spin Avoidance Video
Objective	To determine that the applicant exhibits satisfactory knowledge, risk management, and skills associated with stalls and spins, flight situations where unintentional stalls or spins may occur and procedures for recovery from them.
Knowledge	The applicant demonstrates an understanding of:

137.XII.B.K1	Aerodynamics associated with stalls in various airplane configurations, to include the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects
137.XII.B.K2	Aerodynamics associated with accelerated stalls in various airplane configurations, to include the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects
137.XII.B.K3	Stall characteristics (i.e., airplane design), impending stall, and full stall indications (i.e., how to recognize by sight, sound, or feel)
137.XII.B.K4	The published minimum altitude loss of a successful stall recovery under optimum conditions for the aircraft being used if applicable
137.XII.B.K5	Factors and situations that can lead to an accelerated stall and actions that can be taken to prevent it
137.XII.B.K6	Fundamentals of stall recovery
137.XII.B.K7	Aerodynamics associated with spins in various airplane configurations, to include the relationship between angle of attack, airspeed, load factor, power setting, airplane weight and center of gravity, airplane attitude, and yaw effects
137.XII.B.K8	What causes a spin and how to identify the entry, incipient, and developed phases of a spin
137.XII.B.K9	Spin recovery procedure

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Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.XII.B.R1	Factors and situations that could lead to an inadvertent power-on stall, spin, and loss of control
	137.XII.B.R2	Range and limitations of stall warning indicators (e.g., aircraft buffet, stall horn, etc.)
	137.XII.B.R3	Failure to recognize and recover at the stall warning during normal operations
	137.XII.B.R4	Secondary stalls, accelerated stalls, elevator trim stalls, and cross-control stalls
	137.XII.B.R5	Improper spin recovery procedure
	137.XII.B.R6	Design aspects of agricultural aircraft (especially turbine agricultural aircraft) that contribute to spins and adversely affect spin recovery
	137.XII.B.R7	Effect of environmental elements on airplane performance related to spins (e.g., turbulence, microbursts, and high-density altitude)
	137.XII.B.R8	Collision hazards, to include aircraft, terrain, obstacles, and wires
	137.XII.B.R9	Distractions, improper task management, loss of situational awareness, or disorientation
	137.XII.B.R10	Considerations of both fore and aft C.G. limits at different loads situations and how they affect stall/spin susceptibility and recovery
	137.XII.B.R11	Consideration of aerodynamic effects of rapidly changing weight and C.G. due to jettisoning a load
Skills	The applicant demonstrates the ability to:	
	137.XII.B.S1	Properly interpret any installed stall warning devices (angle of attack indicator etc.)
	137.XII.B.S2	Makes proper recovery inputs at the first indication of a stall warning
	137.XII.B.S3	Makes smooth and coordinated control inputs throughout the flight including pullups, flare-outs, and turnarounds

137.XII.C Pilot and Crew Fatigue

Task	Pilot and Crew Fatigue Management
References	AC 120-100; AC 120-103A; FAA Maintenance Fatigue Risk Management; NAAA-POG; NAAREF Combatting Fatigue in Ag Aviation Brochure
Objective	To ensure that the applicant has the tools necessary to assess and manage fatigue.
Knowledge	The applicant demonstrates an understanding of: **137.XII.C.K1** How and who should be judging a person's fatigue levels **137.XII.C.K2** Various tools and assessments available to assist in fatigue management
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.XII.C.R1** The danger that fatigue presents to safety by affecting reaction time and judgement **137.XII.C.R2** The danger of relying on self-assessment of fatigue **137.XII.C.R3** The need to have a straightforward fatigue management plan tailored to individual needs
Skills	The applicant demonstrates the ability to: **137.XII.C.S1** Describe factors that can lead to unsafe conditions caused by fatigue **137.XII.C.S2** Describe fatigue management techniques that will be used by the pilot and other crewmembers **137.XII.C.S3** Describe how to recognize fatigue in themselves and others

137.XII.D Visual Scan and Traffic Deconfliction

Task	Visual Scan and Traffic Deconfliction (See and Avoid)	
References	14 CFR Part 91 §91.113, §91.126, §91.127; 14 CFR Part 107: §107.37, §107.41, §107.43; 14 CFR Part 137: §137.45; AC 90-48E; AIM	
Objective	Ensure the applicant uses effective visual scanning techniques and uses available technologies to maintain situational awareness and avoid traffic conflicts.	
Knowledge	The applicant demonstrates an understanding of:	
	137.XII.D.K1	Federal regulations pertaining to right of way rules including manned and unmanned aircraft
	137.XII.D.K2	Federal regulations pertaining to traffic patterns and what is required to deviate from a traffic pattern
	137.XII.D.K3	Proper scan technique
	137.XII.D.K4	Proper nighttime scan techniques if applicable
	137.XII.D.K5	Proper use of aeronautical charts and chart supplement or electronic equivalents
	137.XII.D.K6	Proper radio techniques and phraseology if applicable
	137.XII.D.K7	Proper use of additional equipment i.e. ADS-B/anti-collision lighting if applicable
	137.XII.D.K8	Average reaction time to a midair conflict as described in AC 90-48
	137.XII.D.K9	Human factors that lead to midair conflicts
	137.XII.D.K10	What a lack of relative motion of a spotted aircraft means in a windscreen or window means
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing:	
	137.XII.D.R1	When and where most midair conflicts happen in a Part 91 environment and techniques used to mitigate them i.e. traffic patterns/approach and radio use if applicable
	137.XII.D.R2	Explain midair conflict hazards unique to the Part 137 environment and scan and scout/recon techniques used to mitigate them
	137.XII.D.R3	Using a proper scan technique for day and night operations including electronic aids as applicable
	137.XII.D.R4	The importance of keeping windows clean and free of obstructions
	137.XII.D.R5	Anticipating threat locations based upon electronic traffic monitoring and known high traffic routes and customary traffic areas
	137.XII.D.R6	Using hearing to anticipate a pending traffic conflict (UAS)

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Skills	The applicant demonstrates the ability to:	
	137.XII.D.S1	Describe a proper traffic pattern/approach if applicable
	137.XII.D.S2	Describe a work area recon that includes a recon for other traffic in the area
	137.XII.D.S3	Describe a proper scan technique that may include electronic devices in the scan to avoid a midair conflict
	137.XII.D.S4	Use proper radio terminology/phraseology if applicable
	137.XII.D.S5	Select and maintain proper ferry altitude to assist with deconflicting other traffic

137.XII.E Settling with Power (RW)

Task	Vortex Ring State (VRS) or Settling with Power (SWP)
References	AFM/POH; FAA-S-8081-16B; FAA-H-8083-21B
Objective	To ensure the applicant understands how to avoid VRS/SWP and how to recover if it should occur.
Knowledge	The applicant demonstrates an understanding of: **137.XII.E.K1** Elements related to VRS/SWP **137.XII.E.K2** AFM/POH limitations for practicing VRS/SWP **137.XII.E.K3** Signs indicating the onset VRS/SWP **137.XII.E.K4** AFM/POH recovery procedures **137.XII.E.K5** Vuichard recovery procedures **137.XII.E.K6** The conditions required to enter VRS/SWP
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.XII.E.R1** Pre-flight planning to avoid tailwind approaches **137.XII.E.R2** Maintain situational awareness with regards to wind direction/velocity **137.XII.E.R3** Ways to avoid the conditions required to enter VRS/SWP
Skills	The applicant demonstrates the ability to: **137.XII.E.S1** Plans a flight to limit exposure to the possibility of VRS/SWP **137.XII.E.S2** Describes recovery techniques for the equipment to be operated

137.XII.F Ground Resonance Effects (RW)

Task	Ground Resonance Effects
References	AFM/POH; FAA-H-8083-21B
Objective	To ensure the applicant understands ground resonance and has the tools necessary to mitigate its risk.
Knowledge	The applicant demonstrates an understanding of: **137.XII.F.K1** Elements related to a fully articulated rotor system and the aerodynamics of ground resonance
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.XII.F.R1** The conditions that contribute to ground resonance and how to avoid them
Skills	The applicant demonstrates the ability to: **137.XII.F.S1** Explain preventive flight technique during takeoffs and landings

137.XII.G Dynamic Rollover (RW)

Task	Dynamic Rollover
References	AFM/POH; FAA-H-8083-21B: Chapter 11
Objective	Exhibits knowledge of the elements related to the aerodynamics of dynamic rollover.
Knowledge	The applicant demonstrates an understanding of: **137.XII.G.K1** The elements related to aerodynamics of dynamic rollover **137.XII.G.K2** The interaction between the anti-torque thrust, crosswind, slope, CG, cyclic and collective pitch control in contributing to dynamic rollover
Risk Management	The applicant demonstrates the ability to identify, assess, and mitigate risks encompassing: **137.XII.G.R1** The increased risk of dynamic rollover due to certain landing zones and their associated challenges **137.XII.G.R2** Common risks associated with dynamic rollover specific to platform and confined space operations **137.XII.G.R3** The importance of preflight inspection and ground crew training to monitor the condition of the landing platform/surface **137.XII.G.R4** Developing and using a procedure to ensure all hoses and equipment is disconnected from the aircraft prior to departure
Skills	The applicant demonstrates the ability to: **137.XII.G.S1** Explain preventive flight technique during takeoffs, landings, and slope operations **137.XII.G.S2** Demonstrate preventive flight technique during takeoffs, landings, and slope landings **137.XII.G.S3** Uses appropriate procedures and coordinates with ground crew to ensure landing surface is in good condition and all ground equipment is disconnected and cleared prior to takeoff

Appendix A: List of References

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AFM/POH	Airplane Flight Manual / Pilot Operating Handbook - The POH for most light aircraft built after 1975 is also designated as the FAA-approved flight manual. The typical AFM/POH contains the following nine sections: General; Limitations; Emergency Procedures; Normal Procedures; Performance; Weight and Balance/Equipment List; Systems Description; Handling, Service, and Maintenance; and Supplements	10–15, 18, 23–25, 27, 29, 31, 33, 34, 36, 43–46, 49–52, 54, 59, 61, 64–67, 69, 73, 75, 78, 85, 90–92
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CAM 8	Civil Aeronautics Manual 8 - Aircraft Airworthiness: Restricted Category. Certification basis for aircraft manufactured prior to 1965. Per AC 20-33B, may still be used in conjunction with relevant sections of 14 CFR to establish airworthiness for aircraft thus initially certificated	10–12, 43
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NAAREF Combatting Fatigue in Ag Aviation Brochure	Combatting Fatigue in Ag Aviation Brochure published by the National Agricultural Aviation Research and Education Foundation (NAAREF)	87
National Aerial Applicator's Manual	National Aerial Applicator's Manual	7–9, 15, 16, 20, 21, 38–40, 42, 47, 48, 53, 54, 56, 58
National Pesticide Applicator Manual	National Pesticide Applicator Certification Core Manual	8, 20, 21, 79
NFPA 407	Standard for Aircraft Fuel Servicing - National Fire Protection Association	20
NPIC	National Pesticide Information Center	82
A Pilot's Guide to Aviation Weather Services	A Pilot's Guide to Aviation Weather Services - National Weather Service	39
Poison Centers	America's Poison Centers Website	82
SDS	Safety Data Sheets - The Hazard Communication Standard (29 CFR 1910.1200(g)) requires that the chemical manufacturer, distributor or importer provide SDSs for each hazardous chemical to downstream users to communicate information on these hazards	8, 20, 82
USDA Atomization Models	USDA Atomization Models - The USDA-ARS Aerial Spray Nozzle Models were developed to provide aerial applicators with a tool for determining the droplet size resulting from an application scenario based on the nozzle used and the operational conditions of the application.	16, 17
Warning Signs of Heat-Related Illness	CDC Infographic Link	82
WPS	Worker Protection Standard - How to Comply Manual	7, 8, 20–22, 77, 80, 82