JOB AID

AERIAL IGNITION

Unmanned Aircraft Systems

February 2020

REVISED
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DUTY: MOBILIZATION			Assessment of knowledge and application. Indicate by providing evaluator initials and date in the column					EVAL RECORD #
TASK	**SUB-TASKS**	**STEPS**	**Novice** (Does not meet the standard)	**Advanced Beginner** (Approaches the standard)	**Competent** (Meets the standard)	**Proficient** (Advanced understanding of the standard)	**Professional** (Leading practitioner of knowledge, culture, and standards)	
1. Communicate with Resources	1.1 Communicate with Dispatch	1.1.1 Contact dispatch for instructions about resource order, location of assignment, contact names and numbers, date and time needed to be on scene, and where ICP is located.						
	1.2 Communicate with Requesting Unit/IMT	1.2.1 Contact the host unit or IMT for information about what capabilities are required. Discuss what the environmental/logistical factors are for your specific work location, e.g. wilderness spike camp or remote locations.						
		1.2.2 Discuss your experience and what you and your module will be able to provide the unit or IMT (under sell/over produce)						
		1.2.3 Discuss with their GIS Specialist what their capabilities are and what you need from them. If you have an UASD within the module, use that person(s) to make this contact.						
	1.3 Communicate with UAS Module	1.3.1 Contact all members of your UAS module to coordinate equipment, times and dates, transportation plans including vehicles, and what your expectations are of each other.						
		1.3.2 Ensure all pilots and personnel have copies of their pilot license and Interagency Card.						

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2. Obtain Airspace Authorizations	2.1 Obtain PASP	2.1.1 Contact Air Operations or Aviation Officer for a copy of the Project Aviation Safety Plan (PASP) and any specific instructions for the local area.						
	2.2 Verify TFR	2.2.1 Discuss needs with Air Operations or Aviation Officer for information about TFRs and what may be needed for LRZs						
	2.3 Obtain NOTAM or SGI	2.3.1 Determine if a NOTAM is required and establish it for future operational periods by using www.1800wxbrief.com						
		2.3.2 Determine if an SGI Waiver is required and complete the waiver form. Contact UAS Coordinator for assistance and coordination.						

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3. Determine Logistical Needs	3.1 Identify best UAS for Mission	3.1.1 Determine which make and model of UAS is most beneficial and can complete the objectives of the assignment.						
	3.2 Coordinate shipping of aircraft and equipment	3.2.1 Contact UAS coordinator or UAS provider with information about shipping the aircraft and equipment to an appropriate location.						
		3.2.2 Establish a timeline with UAS Coordinator for a shipping timeline and communicate those onto dispatch, unit/IMT, and UAS module.						
	3.3 Coordinate shipping of batteries	3.3.1 Determine the watt hours of the batteries as shipping methods and requirements will differ depending on amount of energy.						
		3.3.2 Ship batteries only after packaging each battery in individual plastic blister wrap or paste board while protecting with appropriate packing materials that will prevent short circuiting.						
		3.3.3 Ensure the container is sturdy and labeled correctly for the type and size of batteries. Please refer to UAS website or IATA website for more information about shipping batteries.						
		3.3.4 If traveling by air and with batteries, please refer to FAA website or contact your airline for requirements.						

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4. Determine Travel Plan	4.1 Determine transportation methods	4.1.1 Identify whether flying or driving to the incident is the best course of action for you and the module.						
		4.1.2 If driving, determine what capabilities are needed in the vehicle, i.e., size, truck bed, 4x4, etc. and if using agency or rental vehicles is the best option for this assignment.						
		4.1.3 In remote locations that require specialized assistance to access your worksite, coordinate with local management to establish transport methods, e.g., a boat is needed to assess your incident.						

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1. Obtain Mission Information	1.0 Check In at Incident/ Inspect Equipment	1.0.1 Gather and inspect equipment post travel/shipment						
		1.0.2 Insure the level of charge for all necessary equipment						
	1.1 Attend Briefings/ Gather Intel	1.1.1 Attend Air Ops Briefing as active participant						
		1.1.2. Attend Ops/Mission Briefings as active participant						
		1.1.3 Attend Line Briefing as active participant						
		1.1.4 Make contact with Situation Unit and obtain necessary maps						
		1.1.5 Determine overall mission objectives						
	1.2 Evaluate Situation	1.2.1 Evaluate mission objectives/ weather forecasts for UAS capabilities						
	1.3 Disseminate Intel	1.3.1 Brief UAS module						

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2. Mitigate Supply/Logistical Needs	2.1 Determine Supply Needs	2.1.1 Determine Necessary Supplies (may include: glycol. Precision plastic spheres, generator, fuel for generator, iCom radio, chainsaw kit, tow strap, hand tools)						
		2.1.2 Acquire available supplies *If IMT then: Utilize the common incident ordering procedures: signed General Message form to supply for common fireline needs. Communicate with other UAS partners to locate needed items. Work directly with ordering team or appropriate IMT personnel to obtain other necessary supplies. Complete all necessary documentation for purchases.* *If no IMT then: Communicate with other UAS partners to locate other needed items. Obtain the appropriate level of authorization from the project manager prior to making purchases or allocating funds associated with the project for needed supplies. Complete all necessary documentation for purchases.*						
		2.1.3 Acquire other necessary supplies through commercial vendors						
	2.2 Determine Logistical Needs	2.2.4 Obtain a vehicle(s) adequate to safely transport all necessary equipment and personnel to and from site						
		2.2.5 Determine means of securing equipment when not in use						

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3. Establish Communications	3.1 Utilize Communication Plan	3.1.1 Review ICS 205, ICS 220, and ICS 204 to acquire air-to-air and air-to-ground radio frequencies relevant to assignment.						
		3.1.2 Exchange cell phone numbers with line leadership, overhead, and necessary IMT personnel						
	3.2 Prepare Comm Devices	3.2.1 Program and verify AM radio frequencies						
		3.2.2 Program and verify FM radio frequencies						

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4. Visit Site	4.1 Determine Travel Route	4.1.1 Plan travel from current location to area of mission execution						
		4.1.2 Travel to site						
		4.1.3 Evaluate site conditions: fuels, containment lines, hazards, height of vegetation/timber, size						
		4.1.4 Determine preliminary mission profile (to aid in determining number and location of LRZs)						

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4. Visit Site	4.2 Determine LRZ	4.2.1 Locate and evaluate LRZ (proximity to site, ingress/egress, line of site, not an impact to or impacted by overall mission objectives)						
		4.2.2 Improve LRZ (remove/limb trees, level ground, Dust abatement)						
		4.2.3 Evaluate LCES considering potential impacts from mission						
		4.2.4 Establish alternate LRZs						
	4.3 Develop Mission Profile	4.3.1 Plan mission execution						
		4.3.2 Develop firing plan to achieve mission objectives; consider evaluated fuels, weather, and topography						
		4.3.3 Determine appropriate time of day for mission execution						
		4.3.4 Determine timeframes for mission completion						
		4.3.5 Evaluate supply, logistic, and resources needs based on mission as planned and contingencies						
		4.3.6 Establish trigger points for evaluation of mission execution/ meeting objectives						

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5. Establish CRM	5.1 Establish Chain of Command	5.1.1 Establish and follow chain of command within UAS module						
		5.1.2 Establish and follow chain of command on Incident/mission						
	5.2 Determine Roles and Responsibilities	5.2.1 Delegate responsibilities within UAS module to insure efficient and complete execution of mission (establish accountability)						
		5.2.2 Make sure everyone is fit for duty physically and mentally						

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6. Prepare System	6.1 Prepare Aircraft	6.1.1 Assemble aircraft with legs installed and arms extended and locked						
		6.1.2 Place aircraft on level surface, away from large metallic or electronic devices						
		6.1.3 Power on Controller						
		6.1.4 Install flight batteries						
		6.1.5 Power on aircraft and await connection						
		6.1.6 Perform IMU and Compass calibration per manual						
	6.2 Prepare Payload	6.2.1 Assemble payload and install battery						
		6.2.2 Power on tablet with payload App and insure Bluetooth in on						
		6.2.3 Power on payload and connect via-Bluetooth through payload App						
		6.2.4 Bench Test Payload per product manual						
		6.2.5 Configure aircraft for operation by attaching payload to aircraft						

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6. Prepare System	6.3 Prepare Camera	6.3.1 Verify SD cards are in camera						
		6.3.2 Attach camera to aircraft while aircraft is powered off						
		6.3.3 Power on tablet, controller, and aircraft						
		6.3.4 Connect to aircraft via flight control app						
		6.3.5 Verify camera feed, gimbal operation, and camera settings						
	6.4 Prepare GCS	6.4.1 Verify latest versions of flight control apps are installed						
		6.4.2 Connect to aircraft via flight app						
		6.4.3 Verify aircraft settings						
		6.4.4 Verify payload, aircraft, and camera settings						
		6.4.5 Upload maps/data to flight control app and verify overlay accuracy						

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6. Prepare System	6.5 Verify System Functionality	6.5.1 Verify Notam/SGI documentation is complete						
		6.5.2 Perform test flights of area of operation to verify functionality of system						

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1. Apply fireline tactics	1.1 Utilize LCES	1.1.1 Ensure LCES is applied within UAS module						
		1.1.2 In communication with someone who can see main fire						
		1.1.3 Advise ignition crew members of potential/impending safety hazards and appropriate mitigation actions (e.g., posting lookouts, identifying safety zones and escape routes)						
	1.2 Validate fire behavior	1.2.1 In briefing with personal assigned to incident						
		1.2.2 Understand agency objectives and desired product						
	1.3 Validate fire weather	1.3.1 Through briefing / spot weather forecast for fire weather predictions						
		1.3.2 Utilize appropriate weather observations, predicted and observe						
		1.3.3 Communicate fire weather forecasts with assigned UAS module						

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1. Apply fireline tactics	1.4 Validate firing patterns	1.4.1 Determine optimal firing patterns for desired firing effects						
		1.4.2 Set geo fence within Ignis App						
		1.4.3 Conduct ignition operations according to implementation plan						

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2. Fly Aircraft	2.1 Utilize checklists	2.1.1 Preflight checklist specific DJI M 600						
		2.1.2 Before Takeoff checklist Specific DJI M 600						

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2. Fly Aircraft	2.2 Launch Aircraft	2.2.1 Takeoff checklist specific DJI M 600						
		2.2.2 Coordinate separation with other assigned aircraft						
		2.2.3 Make blind calls						
		2.2.4 Inform local dispatch of mission before lifting off						
		2.2.5 Perform 20/20 checklist						
	2.4 Maintain CRM	2.4.1 Establish direct communication with visual observer						
		2.4.2 Verbalize eyes up / eyes down when flying						
		2.4.3 VO verbalizes potential aerial hazards and predetermined commands of climb/descend						
		2.4.4 VO confirms with pilot airspace coordination's in place						
		2.4.5 VO confirms with pilot all required firing personal are aware of PSD operations						

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2. Fly Aircraft	2.5 Fly to Mission Set Point	2.5.1 Use onboard camera and downloaded map for situational awareness						
		2.5.2 Ensure set point is within previously set geo fence						
		2.5.3 Use onboard camera at 90 degree to ensure adequate elevation to avoid aerial hazards						
	2.6 Fly Practice (dry) runs	2.6.1 Determine distance from LRZ to beginning of set mission point						
		2.6.2 Ensure VO has visual on intended area of flight and surrounding airspace						
	2.7 Maintain Flight Efficiency	2.7.1 Preplan flight throughout mission to gather SA on flight to start point as well as flight back						
	2.8 Maintain range and radio line	2.8.1 Pilot and VO are expected to adjust locations to mitigate obstructions that maybe decrease link from GCS to UAS						
		2.8.2 VO will monitor both AM and FM radio for air to ground radio traffic and air to air radio traffic						
	2.9 Practice RTL and LOL	2.9.1 Determine contingency plan if Go Around landing is necessary						
		2.9.2 Access potential emergency landing areas while in route to mission begin point						

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3. Operate GCS	3.1 Configure Aircraft Settings	3.1.1 Controller on aircraft on app connected						
		3.1.2 Confirm battery percentage is 99-100 %						
		3.1.3 Set maximum desired elevation/AGL						
		3.1.4 Set maximum distance from LZR						
		3.1.5 Set C1 button, enabling camera to nadir						
		3.1.6 Set C2 button to 90 degrees						
		3.1.7 Find appropriate IR color palate SCX/PIP						
		3.1.8 Confirm RTL max height						
	3.2 Configure Payload Settings	3.2.1 Connect Ignis app to tablet						
		3.2.2 Injection amount 2.0 mL						
		3.2.3 Battery life no less then						

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3. Operate GCS	3.2 Configure Payload Settings	3.2.4 Ensure pluggers are completely empty						
		3.2.5 Fill rear reservoir						
		3.2.6 Fill side A						
		3.2.7 Fill side B						
		3.2.8 Refill rear reservoir						
		3.2.9 Reinsert puncture needles into slipper blocks						
		3.2.10 Load hopper past fill line to ensure hopper is completely full						
		3.2.11 Agitate hopper to prevent ball jam						

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3. Operate GCS	3.3 Utilize GCS telemetry	3.3.1 Give command to VO that pilots eyes are down and on screen						
		3.3.2 Orient location are UAS using know landmarks and direction arrows located within app						
	3.4 Utilize Maps	3.4.1 Toggle between pre-downloaded area maps and onboard camera to determine aircraft orientation and direction						
		3.4.2 Open discussion with firing boss and VO to aircrafts location						
4. Operate Payload	4.1 Communicate Firing Sequence	4.1.1 Move S3 on control bar into the armed position (up towards user): 4.1.2 Prepare to fire 4.1.3 Ready to fire 4.1.4 Start firing 4.1.5 Prepare to stop firing 4.1.6 Ready to stop 4.1.7 Stop firing 4.1.8 Firing stopped 4.1.9 Chutes clear						

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4. Operate Payload	4.2 Drop Balls	4.2.1 Utilize C1 GCS button to nadir onboard camera and confirm balls are dropping from both shoots of PSD						
		4.2.2 Confirm with icon in top right of GCS screen balls are dropping in 2 second intervals						
		4.2.3 Check that Ignis's status indicates it is idle						
		4.3.4 Note that stopping process can take 20-40 seconds						
	4.3 Perform Wind Checks	4.3.1 Observe ball drift with camera nadir and determine inset from geo fence within the burn side						
		4.3.2 Adjust elevation of UAS to increase drift increase elevation NOT recommended to descend elevation unless full confident UAS will clear all terrain						
	4.4 Determine Drop Height	4.4.1 Adjust drop height based on wind drift and terrain features						
	4.5 Determine Sphere Spacing	4.5.1 Increase aircraft forward speed to increase ball spacing, decrease forward speed for reduced ball distance						
		4.5.2 Balls spacing is determined by aircraft speed, dropping ball every 2 seconds						
	4.6 Coordinate Drop Patterns	4.6.1 Regulate the heat and intensity based on holding controllability and desired fire effects						

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5. Operate Camera	5.1 Utilize Camera to fly in BVLOS	5.1.1 Confirm SD data cards and formatting are complete						
	5.2 Utilize Camera to Maintain Flight Awareness	5.2.1 Confirm aircrafts height, location, and trajectory in relation to home and assigned objectives.						
6. Emergency Procedures	6.1 Communication Failure Checklist	6.1.1 Stop ignitions and dropping: Switches off, system stopped						
		6.1.2 Alert operators and bystanders						
		6.1.3 Visually verify dropping stopped						
		6.1.4 Return drone to landing zone and land						

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6. Emergency Procedures	6.2 In-flight Fire checklist	6.2.1 Check for in-flight fire						
		6.2.2 Disarm Ignis						
		6.2.3 Fly over safe ignition area						
		6.2.4 Trigger dropper emergency ejection						
		6.2.5 Return drone to landing zone and land						
		6.2.5 Return drone to landing zone and land						

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1. Maintain CRM	1.1 Debrief with Line	1.1.1 Actively participate in formal debrief with line personnel (AAR)						
		1.1.2 Leads UAS portion of debrief						
		1.1.3 Initiates necessary changes based on feedback						
	1.2 Maintain CRM with line Supv, module, etc...	1.2.1 Receive operational feedback						
		1.2.2 Engage all active participants (UAS module, ground forces, line supervisors, safety)						
		1.2.3 Initiate necessary changes based on feedback						
2. Inspect System	2.1 Inspect Aircraft	2.1.1 Visually inspects aircraft for abnormalities						
		2.1.2 Physically inspects propellers						
		2.1.3 Thoroughly inspects as dismantling and packaging aircraft						
		2.1.4 Notes and acts to replace/repair parts						

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2. Inspect System	2.2 Inspect Payload	2.2.1 Visually inspects payload for abnormalities						
		2.2.2 Dismantles payload and inspects for damage						
		2.2.3 Notes and acts to replace/repair parts						
3. Refurbish System	3.1 Charge System	3.1.1 Charges controller 3.1.2 Charges tablet 3.1.3 Charges aircraft batteries 3.1.3.1 Allows batteries to cool before charging if hot 3.1.3.2 Immediately starts charging with generator when mission demands, or charges at home unit/camp 3.1.3.2 Places batteries in warm storage if temperatures are cold 3.1.4 Charges payload batteries 3.1.4.1 Selects proper charger settings for LiPo battery (2S, 3S, charge rate) 3.1.4.2 Monitors battery for deformities 3.1.4.3 Places batteries in warm storage if temperatures are cold						
	3.2 Resupply kit	3.2.1 Orders replacement consumables 3.2.2 Orders replacement payload parts 3.2.3 Fuels generator						

DUTY: POST MISSION			Assessment of knowledge and application. Indicate by providing <u>evaluator initials and date</u> in the column					EVAL RECORD #
TASK	**SUB-TASKS**	**STEPS**	**Novice** (Does not meet the standard)	**Advanced Beginner** (Approaches the standard)	**Competent** (Meets the standard)	**Proficient** (Advanced understanding of the standard)	**Professional** (Leading practitioner of knowledge, culture, and standards)	
5. Manage Data	5.1 Download data	5.1.1 Performs data grab from all storage devices (aircraft and payload) 5.1.2 Saves files in UASD data template 5.1.3 Formats/deletes SD cards as appropriate 5.1.4 Reinstalls SD cards into equipment						
	5.2 Prepares data	5.2.1 Georeferenced data 5.2.2 Sorts and files appropriate data						
	5.3 Transfer data	5.3.1 Transfers clean data files to relevant personnel 5.3.2 Verifies that data product meets end user needs						
6. Cleans Equipment	6.1 Clean aircraft	6.1.1 Removes dust as necessary						
	6.2 Clean payload	6.2.1 Follows manufacturer's recommended instruction for cleaning ignition payload 6.2.2 Removes dust and debris from other payloads						

DUTY: MISSION EXECUTION			Assessment of knowledge and application. Indicate by providing evaluator initials and date in the column					EVAL RECORD #
TASK	**SUB-TASKS**	**STEPS**	**Novice** (Does not meet the standard)	**Advanced Beginner** (Approaches the standard)	**Competent** (Meets the standard)	**Proficient** (Advanced understanding of the standard)	**Professional** (Leading practitioner of knowledge, culture, and standards)	
7. Secure Equipment	7.1 Secures aircraft	7.1.1 Places aircraft, controller, and tablet in their case or adequate location until next mission 7.1.2 Packages aircraft, controller, and tablet for shipping or transport to home unit						
	7.2 Secures payload	7.2.1 Places payload in its case or adequate location until next mission 7.2.2 Packages payload for shipping or transport to home unit						
	7.3 Secures support equipment	7.3.1 Places support equipment in its container						

DUTY: DEMOBILIZATION			Assessment of knowledge and application. Indicate by providing evaluator initials and date in the column					EVAL RECORD #
TASK	**SUB-TASKS**	**STEPS**	**Novice** (Does not meet the standard)	**Advanced Beginner** (Approaches the standard)	**Competent** (Meets the standard)	**Proficient** (Advanced understanding of the standard)	**Professional** (Leading practitioner of knowledge, culture, and standards)	
1. Communicate with Resources	1.1 Communicate with dispatch	1.1.1 Contact dispatch that your assignment is finished, and you are available for reassignment if needed. 1.1.2 Contact dispatch for travel back to home unit if needed.						
	1.2 Communicate with Hosting Unit/IMT	1.2.1 Contact Hosting Unit/IMT that your assignment is finished (if they are not aware) and coordinate for a new UAS Module to arrive if necessary. 1.2.2 Coordinate any final products that are needed for thee Hosting Unit/IMT.						
	1.3 Transition with new UAS Module	1.3.1 If being replaced by another UAS Module, contact them and provide a full briefing. 1.3.2 Provide support for new UAS Module with data and equipment if needed.						

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TASK	**SUB-TASKS**	**STEPS**	**Novice** (Does not meet the standard)	**Advanced Beginner** (Approaches the standard)	**Competent** (Meets the standard)	**Proficient** (Advanced understanding of the standard)	**Professional** (Leading practitioner of knowledge, culture, and standards)	
2 Determine Logistical Needs	2.1 Contact UAS Coordinator	2.1.1 Communicate to UAS Coordinator that your assignment has ended.						
	2.2 Coordinate shipping of aircraft and equipment	2.2.1 Contact UAS coordinator or UAS provider with information about shipping the aircraft and equipment to an appropriate location. 2.2.2 Establish a timeline with UAS Coordinator for a shipping timeline and communicate those onto dispatch, unit/IMT, and UAS module.						
	2.3 Coordinate shipping of batteries	2.3.1 Determine the watt hours of the batteries as shipping methods and requirements will differ depending on amount of energy. 2.3.2 Ship batteries only after packaging each battery in individual plastic blister wrap or paste board while protecting with appropriate packing materials that will prevent short circuiting. 2.3.3 Ensure the container is sturdy and labeled correctly for the type and size of batteries. Please refer to UAS website or IATA website for more information about shipping batteries. 2.3.4 If traveling by air and with batteries, please refer to FAA website or contact your airline for requirements.						

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3 Determine Travel Plan	3.1 Determine travel methods	3.1.1 Facilitate travel plans for your UAS Module back to their Home Unit. Coordinate all logistical needs through the Host Unit/IMT and dispatch. 3.1.2 If your module is reassigned, close out all necessary elements for the current assignment and refer to "Mobilization" for next assignment.						

DUTY: MISSION EXECUTION			Assessment of knowledge and application. Indicate by providing evaluator initials and date in the column					EVAL RECORD #
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7. Secure Equipment	7.1 Secures aircraft	7.1.1 Places aircraft, controller, and tablet in their case or adequate location until next mission 7.1.2 Packages aircraft, controller, and tablet for shipping or transport to home unit						
	7.2 Secures payload	7.2.1 Places payload in its case or adequate location until next mission 7.2.2 Packages payload for shipping or transport to home unit						
	7.3 Secures support equipment	7.3.1 Places support equipment in its container						

Evaluation Record # _____

Trainee Information

Printed Name:
Trainee Position on Incident/Event:
Home Unit/Agency:
Home Unit /Agency Address and Phone Number:

Evaluator Information

Printed Name:
Evaluator Position on Incident/Event:
Home Unit/Agency:
Home Unit /Agency Address and Phone Number:

Incident/Event Information

Incident/Event Name: Reference (Incident Number/Fire Code):
Duration:
Incident Kind: Wildfire, Prescribed Fire, All Hazard, Other (specify):
Location (include Geographic Area, Agency, and State):
Management Type (circle one): Type 5, Type 4, Type 3, Type 2, Type 1, Area Command
OR Prescribed Fire Complexity Level (circle one): Low, Moderate, High
FBPS Fuel Model Letter: G = Grass, B = Brush, T = Timber, S = Slash

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Home Unit /Agency Address and Phone Number:

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Printed Name:

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Incident/Event Information

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