United States Department of Agriculture

US Forest Service Standards for Multi-Engine Water Scooper Operations 2026

Forest Service

In accordance with Federal Civil Rights law and U.S. Department of Agriculture (USDA) Civil Rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior credible activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.), should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer and lender.

Preparation, Review, and Approval (Signatures)

The following signatures designate leadership roles in preparing, reviewing, and approving the Standards for Multi-Engine Water Scooper Operations

Prepared by:

LESLIE CASAVAN
Digitally signed by LESLIE CASAVAN
Date: 2025.12.11 12:09:17 -08'00'

Leslie Casavan
National Airtanker Program Manager

JUSTIN BOHANNAN
Digitally signed by JUSTIN BOHANNAN
Date: 2025.12.11 13:53:35 -08'00'

Justin Bohannan
National Assistant Airtanker Program Manager

Reviewed by:

CHRIS TIPTON
Digitally signed by CHRIS TIPTON
Date: 2025.12.11 15:00:37 -07'00'

Chris Tipton
Branch Chief, Fixed-Wing Operations

Russel R. Knight
Digitally signed by Russel R. Knight
Date: 2025.12.11 15:32:10 -07'00'

Russ Knight
Branch Chief, Airworthiness

LORI CLARK
Digitally signed by LORI CLARK
Date: 2026.01.15 11:29:07 -07'00'

Lori Clark
Branch Chief, Aviation Safety

Approved by:

PAUL LINSE
Digitally signed by PAUL LINSE
Date: 2026.01.15 13:13:08 -07'00'

Paul Linse
Assistant Director, Aviation

This is a Forest Service Fire and Aviation Management sponsored publication.

Questions regarding content of this publication may be directed to the National Airtanker Program Manager or Branch Chief, Fixed-Wing Operations.

The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader and does not constitute an endorsement by the USDA Forest Service of any product or service to the exclusion of others that may be suitable.

This publication is posted at https://www.fs.usda.gov/managing-land/fire/aviation/publications
Previous Edition: 2019.

Review and Revision Schedule: The National Airtanker Program Manager will review these standards annually, and make changes as needed. Significant changes made will be documented on a Digest Form (below), reviewed by the Regional Aviation Officers, WO Branch Chiefs and approved by either the Assistant Director, Aviation or the Fire & Aviation Management Deputy Director, Aviation & Operations.

DIGEST

The table below provides a list of approved significant changes made to the current approved version of these standards.

Note: This list is not inclusive of all changes made in the Standards for Multi-Engine Water Scooper Operations.

Page	Section/ Chapter	Changes, Clarification, Edit
i		Changed the title of the document from Amphibious Water Scooper Aircraft Operations Plan to FS Standards for Multi-Engine Water Scooper Operations
10	1.1	Updated the Background section to more relevant and current information
12	2.1	Added the Amphibious Water Scooper roles and responsibilities
15	4.1	Removed AMI list and added the link to get to the most current AMI list
19	7.3	Added language requiring FWPT for AWSMs who direct the ground movement of the scooper aircraft
26	8.2	Added language requiring a daily FRAT
28	8.4.3	Added language requiring GSE to be moved by vendor or FBO personnel
	App F	Removed Appendix F which was Aerial Supervision requirements. The PMS 505 houses the aerial supervision requirements and should be the only reference personnel should be reviewing for those requirements.
Throughout		Removed CL-415 references and either added CL-215T where relevant, or defined which aircraft the section was referencing in particular.
Throughout		Changed from “Water Body” to “Water Source”
Throughout		Changed any contract language to match the new contract
Throughout		Changed titles of documents and added NWCG documents
Throughout		Changes to aircraft titles and qualifications
Throughout		Updated web addresses

Contents

This page intentionally left blank

1.0 Introduction

1.1 Background

Department of Interior and State and Provincial agencies have historically used water scoopers in Alaska, Canada, and limited areas of the United States. The U.S. Forest Service (FS) began shared funding of two CL-215 Amphibious Water Scooper Aircraft (AWSA) with the Office of Aviation Services in 2012 in part due to the Rand report on use of aerial assets for wildfire response.

In 2009, the FS contracted with the RAND Corporation to analyze the cost benefit of the optimum mix of helicopters and airtankers. RAND produced a final report in July of 2012 concluding that the FS needed up to 40 water scoopers and much smaller numbers of airtankers and type 1 helicopters. This conclusion was based on a Government Owned / Contractor Operated (GOCO) model and incomplete analysis of a Contractor Owned and Operated model. As a result of some of the Rand report findings, the FS recognized the value in a mixed fleet and began the contracting process to add multi-engine water scoopers to the contracted aerial firefighting fleet.

In 2014, the FS awarded a contract for one exclusive use (EU) CL-415. The demand and use have grown substantially since it was first introduced, due partly to the increased performance over the CL-215, and increased acceptance by varying agencies and geographic areas. By 2016 the program grew to two EU CL-415s and two CWN CL-415s to the current ten (10) CWN CL-415 and CL-215T.

This document does not reference or include information on Single Engine Water Scoopers or single engine float planes. Several states and the DOI contract for the Single Engine Water Scoopers.

1.2 Objective

The US Forest Service Standards for Multi-Engine Water Scooper (MES) Operations references or supplements policy and connects contract requirements with policy for the planning, management and operations of FS contracted multi-engine water scooper operations.

The objective of this operating plan is to identify standardized processes and procedures for utilization by staff, supervisors, specialists, and managers for planning, administering and conducting water scooper operations.

Currently, the FS contracts up to 10 scoopers (CL-415 & Cl-215T).

1.3 Scope

The objective of MES's positioning and utilization to meet existing and anticipated incident preparedness, severity, and wildland fire needs regardless of geographic location or agency jurisdiction. MESs are "national resources" in terms of national utilization, high demand, and limited availability.

MES are one part of a multi-faceted national interagency wildfire response effort, they are important to Federal, state, and local wildland firefighting missions of protecting communities and natural resources from wildfires.

1.4 Policy

All water scooper operators and operations shall comply with this standards document as well as applicable provisions of the following:

- Title 14 Code of Federal Regulations (14 CFR). Parts 91, 145, 61 and 137.
- FS Manual (FSM – 5700)
- FS Handbook (FSH - 5709.16)
- FS Fire and Aviation Management Qualifications Guide (FSH - 5109.17)
- Respective Forest Service Contract
- Interagency Standards for Fire and Fire Aviation Operations (Redbook)
- PMS 518 NWCG Standards for Water Scooper Operations
- PMS 505 NWCG Standards for Aerial Supervision
- National Interagency Standards for Resource Mobilization
- PMS 508 NWCG Standards for Airtanker Base Operations

MES operations require regulations, manuals, guides, plans, standards, and checklists to execute and coordinate operations in a safe and effective manner. Where the terms “shall” and “must” are used in manuals, handbooks, standards or guides, compliance with those items is mandatory and not discretionary (FSM 1110.8 - Exhibit 01 Degree of Compliance or Restriction in Directives).

When the aircraft and flight crews are performing operations for other agencies or cooperators where policy may differ, the Forest Service’s policies, guidance, and standard operating procedures shall be followed.

2.0 Program Management

All MESs under contract with the US Forest Service shall adhere to the specifications set forth in the contract under which they are operating. Any concerns, requests, or proposed deviations to contract specifications shall be vetted through the assigned Contracting Officer and/or the National Airtanker Program Manager (NAPM) prior to execution. MESs are a specialized component of the National Airtanker Program, requiring significant coordination at the Geographic Area and Regional levels, including water source planning, agency liaison work, contractor support, and mission prioritization.

2.1 Amphibious Water Scooper Manager - AWSM

An AWSM will be assigned to each pair of MESs activated on a task order. Some of the duties of the AWSM are:

- Direct work.
- Administer MES services contract.
- Suspend operations pending the removal or reinstatement of unsatisfactory equipment or personnel by the COR.
- Conduct investigations and prepare Statements of Findings when requested by the COR.
- Initiate and sign correspondence and other contract administration documents over the title "AWSM."
- Maintain Daily Diary of contract activities.
- Submit the NICC Airtanker Status Form daily.
- Document availability, flight times, and other payment items and submit daily into IBS and FLIGHT.
- Fill out the Forest Service Contracted Airtanker/Scooper Status Notification form for Out of Service aircraft.
- Document Unavailability on the Daily Diary, FLIGHT and IBS, and facilitate the Return to Contract Availability (RTCA) process to include the assigned AMI and COR.
- Document and verify reasonable costs for Scooper base operations.
- Responsible for the tracking and use of the National Air Card (fuel card) system.
- Establish daily schedules in coordination with the local unit and/or incident.
- Work with the local unit and/or incident and COR to approve or deny requests for authorized breaks.
- Review the A/C Data Record for Inspection and Approval currency.
- Review the Interagency Qualification Card(s) for currency and qualifications.
- Discuss, develop, and document an Inclement Weather Plan (IWP)
- Coordinate with local/requesting unit regarding water source coordination and ensure that all aquatic invasive species (AIS) prevention is being followed per contract and the “Guide to Preventing Aquatic Invasive Species transported by wildland fire operations”

2.2 Ordering and Contract Information

Exclusive Use (EU) and/or Call-When-Needed (CWN) MESs are ordered through the Interagency Resource Ordering Capability (IROC) system as Type 3 Multi-Engine airtanker and in the Special Needs: Water Scooper.

Due to the limited number of MESs, pre-planning of needs and requests is essential between local units, GACCs, NICC and the fixed-wing coordinator.

2.3 Contract Administration

EU or CWN task orders will be awarded for a specific Mandatory Availability Period (MAP) or day-by-day time period, during which the Government will have exclusive use of the MES.

States may have similar contracts or agreements, which are unique to that entity. Although not under contract with the US Forest Service, these MESs must meet interagency standards to be used on federally protected lands. Consult with the appropriate Regional Aviation Officer for assistance with state MESs. In addition, during periods of high fire activity MESs from provinces in Canada may be used within the United States. Canadian Provincial MESs should be ordered through the National Interagency Fire Center (NIFC) and Canadian Interagency Firefighting Centre (CIFFC) agreement, not through state compacts. MES contract and cooperator information is available by contacting the National Airtanker Program Manager. Unless there is a current interagency aircraft and pilot card, MESs with contracts or agreements from state, county, local or international entities will need to be on a cooperator letter signed by both the FS and Office of Aviation Services.

The Contracting Officer (CO) is responsible for all contracting actions including contracting procedures, contract legality with existing laws, regulations, contract administration, and termination. In the contract administration's function, decisions on claims and disputes are final and can only be appealed to the Board of Contract Appeals or Court of Claims.

The Contracting Officers' Representative (COR) is directly responsible to the CO for monitoring contract performance.[1] This is a contract chain of command and may not include the COR's direct supervisor, forest, or regional aviation staff. The COR and the National Airtanker Program Manager shall make every effort to maintain open dialogue with geographic areas and Regions when contract issues affect water scooper operations and planning. MES contract CORs are assigned by the Contracting Officer and shall be qualified as an Amphibious Water Scooper Manager or other regional and WO aviation personnel. The COR is primarily responsible for assuring compliance with the provisions of the contract. The COR maintains communications with the vendor concerning day-to-day operation, though this may be further delegated to the AWSM. The COR may represent the CO in making minor allowances which do not modify the price or other provisions of the contract. The COR is responsible for verifying the work performed upon which payment is based.

COR certification information regarding training requirements, external training opportunities, and the Federal Acquisition Institute Training Application System (FAITAS) is located at: http://fsweb.wo.fs.fed.us/aqm2/wo/pros/cor.php

[1] Refer to the Designation of COR provided to each water scooper COR for specific duties and responsibilities.

2.3.1 Contract Measurement and Payment

- The contractor provides a minimum of two pilots and one mechanic per aircraft.

    (a) For optional use or CWN activations, availability will start at the roll time when the aircraft departs for the Assigned Work Location (AWL). Availability will end when the aircraft has been released. In the case when the aircraft departs the AWL on the day it has been released, availability will stop when the aircraft is in the blocks at their home base. If the aircraft departs the AWL after the release date, no availability will be paid." Flight time will be paid "out chocks/in chocks" time. Flight time will begin once the aircraft has left its chock and will end once the aircraft has returned to its chock. Total revenue-time will be paid. Mobilization: FT is paid from point-of-hire (main company headquarters) to AWL. For EU Task orders, FT may be paid prior to the MAP start date, although no AV will be paid. Demobilization: FT is paid from AWL to the point-of-hire (main company headquarters). Should an aircraft relocate somewhere other than the original point-of-hire, FT will only be paid from the last AWL back to the original point-of-hire. If an aircraft does not return to the original point-of-hire but to another location, demobilization costs will be paid to either the original point-of-hire or final destination whichever is closer.

- Seven-day staffing is the general schedule, although vendors may propose alternate schedules to the CO.
- IBS, Incident Business System, shall be used to document use and initiate payment.

2.4 Program Management

The MES Program is managed by the National Airtanker Program Manager. Additional programmatic and operational oversight shall be provided by:

- National/Regional Aviation Officers
- National/Regional Aviation Safety Managers
- National/Regional Aviation Maintenance Inspectors (AMI)
- Assistant National Airtanker Program Manager

The National Fixed-wing Coordinator and staff in coordination with the National Interagency Coordination Center (NICC) coordinate operational and strategic movement of MESs with the Geographic Area Coordination Centers (GACCs) to optimize response efficiency and effectiveness.

The Washington Office, in cooperation with Regional Office's Aviation Staff, and MES managers continue to adapt and develop operations and equipment to ensure a stable, efficient, and safe program. This is accomplished with quality assurance review of the current management approach for effectiveness to include program funding, contract specifications, contract length, facilities, specialized training, placement of resources, and operations.

Communication between the geographic areas, Regions, Washington Office and the AWSM is critical to maintain national mobility and response to support aviation and land management operations.

3.0 Interagency Airtanker Board (IAB)

The Interagency Airtanker Board (IAB) evaluates airtankers and scoopers against established performance criteria and recommends approval for use. The IAB promotes standardization and cooperation among NWCG member agencies and airtanker/scooper related industries in all aspects of aerial delivery systems utilization.

3.1 Approval Process

The IAB has established a step-by-step procedure and process for evaluation and approval of aircraft and tank delivery systems. All aircraft and tank delivery systems proposed for approval by the Board shall be submitted in writing by the Proponent to the IAB chairperson for processing. The Board reviews material submitted at each step and must be satisfied that all requirements of a step are met.

For more information, refer to the 2013 Interagency Airtanker Board Procedures and Criteria at: https://fs-prod-nwcg.s3.us-gov-west-1.amazonaws.com/s3fs-public/2023-06/iab-procedures-criteria.pdf

To view the most current IAB Criteria, visit Publications at: https://www.nwcg.gov/committees/interagency-airtanker-board

4.0 Aircraft & Pilot Inspection and Approval

Each year prior to use of MESs and flight crews on Forest Service contracts, the Forest Service will conduct pre-use inspections of aircraft and flight crews for compliance with the contract specifications and conditions. Refer to the current contract for specific information on scheduling and carding processes.

Once carded, aircraft and pilots, the MES is available to operate as specified in the contract.

The cards are valid through the expiration date and can only be changed by the appropriate Forest Service airworthiness representative or pilot inspector.

4.1 Aircraft Return to Contract Availability Process

1. The pilot notifies contractor Director of Maintenance of the discrepancy.
2. The AWSM completes the Forest Service Contracted Airtanker/Scooper Status Notification Form.
3. The pilot and AWSM notifies the Aviation Maintenance Inspector (AMI) assigned.

For the most current AMI contacts, visit https://www.nwcg.gov/committee/airtanker-base-operations-unit and click on the Forest Service Airtanker and Scooper AMI Return to Contract Availability List.

4. The pilot and/or AWSM notifies the COR that the aircraft is “Unavailable”.
5. The contractor takes maintenance action to correct the discrepancy.
6. The AMI monitors progress of contractor’s maintenance action.
7. The aircraft is approved for “Returned to Service” in accordance with 14 CFR by the contractor’s maintenance personnel and the maintenance log is signed off.
8. Once the aircraft is approved for “Return to Service” by the contractor, the AMI approves the aircraft to “Return to Contract Availability”.
9. The COR documents and tracks “Unavailability”.
10. Once the AWSM has completed all the above steps, the aircraft is “Available”.

4.2 Aircraft Maintenance

Due to the nature of their mission, MESs require frequent inspections and maintenance. The AWSM and contractor will coordinate maintenance needs with the local aviation manager.

- Aircraft maintenance is typically performed before and after duty hours. During the duty day, the contractor may request maintenance time. The aircraft may be released from standby and the Contractor will continue to be paid the availability rate, if the aircraft is dispatchable. The Contractor shall provide a reasonable estimated time of completion (ETOC) with the request for an authorized break. Approval to remove the aircraft from standby will be wholly discretionary by the Government.
- “Scheduled maintenance” does not normally require action by agency personnel, just appropriate entries in the aircraft maintenance log and aircraft contract diary. Agency personnel will become involved if the maintenance requires an aircraft to be placed in “unavailable” status and/or major parts are involved. Communication between the AWSM and contractor personnel is essential. The AWSM will communicate maintenance information to the designated agency AMI.
- Unscheduled maintenance must be reported to an AMI.
- Only a qualified AMI can return an aircraft to contract availability after being unavailable. All details will be documented in the appropriate aircraft contract daily diary. If a SAFECOM is to be filed for a maintenance deficiency, it shall include the name of the inspector who approved the aircraft back to contract availability.
- If co-located at an airtanker base, aircraft maintenance and engine run-ups at the base will be coordinated with the ramp manager. Depending upon the situation, it may be necessary to move the aircraft to another area to avoid impacting other aircraft or operations.

4.3 Pilot Inspection and Approval

Pilots will be qualified annually using specific contract guidance as well as meeting FAA and Agency requirements (reference Contract). Airtanker/Scooper Captain (AKP) and above will have an agency flight observation every 5 years.

4.3.1 Proficiency Flight Requirements

If the Pilot-in-Command (PIC) of the mission crew has not flown the contract line-item aircraft type/make/model while on a USFS contract within 30 days, the PIC shall have a proficiency flight in the contract line-item aircraft type/make/model prior to executing any flights supporting USFS operations. The flight shall consist of, but not be limited to a simulated drop, which shall be a non-revenue flight of no less than 30 minutes of flight time not to include startup, taxi or shutdown of the aircraft.

Refer to the contract for specific language on pilot proficiency.

If the pilots meet contract evaluation criteria including the most current Interagency Mission Certification Standards (IMCS), they will be issued a pilot qualification card.

5.0 Conduct and Ethics

All MES personnel employed or contracted by the US Forest Service are accountable to the public for their actions. Professional conduct is expected at all times and is measured by accountability, respect, leadership, communication, and the integrity of the program. Personnel will conduct all operations with the highest regard to safety and within the boundaries of policy and/or the contract. Personnel will only perform those services in which they are qualified, trained, and equipped. They will continue to educate themselves in order to improve and advance their qualifications and performance.

6.0 Communications

Lines of communication are established, and must be maintained, to keep all parties informed of pending or potential issues that may arise.

Contract related issues will be communicated through the COR to the CO and the National Airtanker Program Manager.

Operational issues will be communicated to the National Airtanker Program Manager.

National and Regional personnel, AWSMs, and MES crew or company representatives, are responsible for:

- Resolving problems/issues at the lowest level possible.
- Early and proactive communication to relay anticipated issues or problems that could be a safety issue or affect the availability of a MES.

- Notify the COR, with all contract compliance questions and/or concerns, major maintenance or mechanical issues, disputes, etc.
- The COR will notify the Contracting Officer, AWSM, and the National Airtanker Program Manager if the concerns or issues are outside the scope of his/her COR designation.
- Notify the appropriate national or regional personnel such as maintenance inspectors, inspector pilots, aviation safety managers, operations specialists, etc. depending on the nature of the issue.
- Notify the appropriate dispatch center of aircraft status, i.e., available/unavailable.

7.0 Water Scooper Operations

The priority mission for MESs under FS contract will be for initial attack (IA) of wildfires. The MES will respond to new and emerging fires and aim to provide immediate response actions in the first burning period and are intended to support personnel either on scene or enroute to the incident in suppressing the fire when it is least costly to do so

MES are not assigned to bases which helps to facilitate national mobility and response. An AWSM will be ordered and assigned to a pair of water scoopers. The AWSM may or may not be a COR, but provides technical and operational direction, clarification, guidance and reporting with respect to the contract and payment system, Incident Business System (IBS).

The COR is normally not assigned to the water scoopers when deployed. They are delegated contract administration duties by the CO, while the AWSM is ordered to the MES location to provide daily oversight.

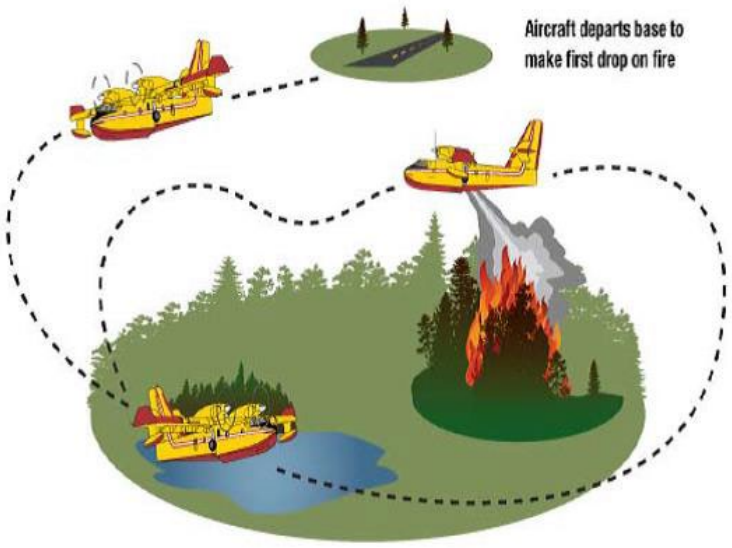
7.1 Concept of Operations

While MESs are fixed-wing assets, their use is similar to Type 1 helicopters. They drop water directly on the fire line making them a direct attack tool.

The typical flight pattern is oval, with a pickup into the wind and a downwind drop on the fire (see schematic below). This is the most common and efficient circuit. When water sources are located next to the fire, a 90-second turnaround time is possible. Typical turnaround times in flat terrain for the CL-415 and CL-215T based on distance from water source are:

- 1 mile – 3 minutes
- 3 miles – 4 minutes
- 6 miles – 6 minutes
- 10 miles – 9 minutes
- 15 miles – 12 minutes

If fire intensity or other reasons indicate a need for drops into the wind or crosswind, then a U-shaped circuit or a figure-8 may be necessary. Turnaround times will be slightly longer.



7.2 Advantages and Limitations

Advantages of MESs include:

- Large volumes of water delivered to the fire when close to the water source.
- Direct attack on the fire.
- When staffed by Initial Attack qualified PIC, aerial supervision may not be required.
- Extended duration at fire scene (i.e., 3.5-to-4-hour fuel cycle).
- Frequent aerial intelligence or updates.
- Flight crews experienced in both Alaska and the lower 48 states.
- Ability to work directly with firefighters on the line (i.e., give and receive feedback).
- Support of retardant and dozer operations and attacking spot fires.

Limitations of the MESs include:

- Must have suitable water source nearby.
- Not designed for line building.

7.3 Bases and Facilities

The operating location could be anywhere in the United States. MESs can operate from any approved airport that meets the following requirements:

Generally, MESs do not operate out of airtanker bases. The MES will work out of a local/regional airport FBO (fixed based operator). Coordination is done beforehand by the AWSM to make sure all accommodations can be met.

1. Runway Surface**:** Hard surface runway is the standard requirement with a runway, taxiway, and ramp capable of supporting 36,000 pounds.

   Gravel runways may only be used with prior approval of the vendor.

2. Runway Length**:** At least 3,500 feet.

3. Airstrip Pressure Altitude: MESs have a fight manual limitation of operating (take-off or landing) from an airstrip no higher than 10,000' Pressure Altitude.

4. Fuel**:** Jet A. Fueling by truck is preferred; however, non-truck fueling is an option on a case-by-case basis. If DLA fuel is available, it must be used over other sources.

5. Avionics**:** 2 - VHF AM, 2- VHF –FM, AFF

Fixed-wing base ramp operations shall adhere to the ramp operations procedures in the PMS 508 NWCG Standards for Airtanker Base Operations (SABO). Agency personnel involved in directing the ground movement of the MESs, shall be qualified as a Fixed Wing Parking Tender.

7.4 Pre-Use Requirements

The following requirements must be met before using MES assets:

1. Facilities. Airport approval and ramp space must be secured.

2. Acceptable Water Sources. The agency AWSM will coordinate water sources as needed, based on geographic area and recreation levels.

3. Supporting Materials for Pilots. Geographic hazard maps may be supplied by specific units as needed, and incident maps coordinated between the PIC and the AWSM per the NIFC FTP website. In-briefings by local ATGS are preferred to review local area protocol, and frequencies for local flight following if other than the National Flight Follow frequency is used.

4. Briefing. Operations briefing by incident commanders, agency administrators, dispatch, and resources personnel must be completed, and re-briefed as appropriate (e.g., change in personnel, strategy, or tactics).

7.5 Mobilization and Repositioning

MESs are national resources. The MESs will generally be kept together as a pair, however they may be separated based on strategic or tactical considerations. The GACC where the aircraft are operating will make the scoopers available for wildland fire assignments when requested by the NICC. The aircraft will be dispatched by the GACC or unit where they are located. Movement of these aircraft will be through the normal dispatch channels. The GACC, in cooperation with the FS Fixed-Wing Coordinator and AWSM, will determine standby locations based on projected or current needs. Coordination between the GACC and the AWSM is essential to the successful movement and utilization of these resources.

Coordination for repositioning and/or initial attack requests for the MES will be done through dispatch with the assistance of the AWSM and/or the GACC. Before the MES is dispatched to an incident, the pilot will be provided with a Tactical Aircraft Resource Order (TARO), or other similar dispatch form. Aircraft will not be dispatched to an incident with unclear or incomplete orders, or with just a resource order form. Minimum information required for mission flights includes a dispatch form which provides aerial and ground frequencies, coordinates as well as other aircraft that have been ordered.

Aircraft prepositioning will require an agency flight plan (radio check-in/automatic flight following (AFF)), resource order, and flight strips. For other flights, a Federal Aviation Administration (FAA) flight plan will be filed in lieu of an agency flight plan. Dispatch will document planned flight following procedures.

Flights to and from incidents will not be below 500 feet above ground level. MES will typically transit to and from the incident at lower altitudes when the water source is near the incident. Non-mission (ferry) flights or mission flights may occur after daylight hours. Aircraft engaged in or traveling to firefighting operations will use a special beacon code (Transponder 1255).

Known aerial hazards and any airspace confliction problems (MTR, MOA, SUA, etc.) must be noted. Preferably two bearing and distances off of base/VHF Omnidirectional Range (VOR), and the latitude and longitude of the incident will be provided. All resource order information should be verified by both the AWSM and pilot for accuracy.

7.6 Operational Considerations and Requirements

7.6.1 Water Source

Treat each water source as an individual entity requiring examination, evaluation, and a decision made regarding its usage (see *appendix B – Scooper Water Source Coordination Worksheet*). Each water source will have pre-established procedures identified relating to:

- Water source ownership
- Law enforcement
- Recreation Mitigation
- Primary contacts
- Use

Aquatic Invasive Species status

Appendix C summarizes the water source selection process.

Additional water scooping considerations and requirements include:

- MESs have a flight manual limitation of picking up water from sources that are above 8,000’ Pressure Altitude.
- Geographic areas, regions and forests are encouraged to create water source maps and list avoidance areas, if required.

- Aerial Supervision should scout the fire area for possible water sources prior to MES arrival.
- The AWSM and ATGS may suggest water sources, as needed. But the MES PIC will determine water source suitability.
- MESs scoop at 70-80 knots and fill their tanks in 10-12 seconds. The required size of the water source varies with altitude, temperature, wind, and surrounding terrain. Sea level scooping distance approximately 1 mile, 8000' pressure altitude distance, approximately 2.5 miles.

Flight crews will generally avoid muddy water due to potential underwater obstacles. Although MESs can scoop from the ocean, it is not desirable because of associated corrosion of aircraft components and potential environmental impacts of saltwater on land resources.

- Environmental factors such as wind, elevation, temperature, and surrounding terrain may impact usability of a water source.
- The minimum scooping depth is 6 feet. Water depth of at least 10 feet is preferred to allow the aircraft to land on the water if necessary.

7.6.2 Environmental Considerations

A full range of environmental considerations needs to be explored before using MESs. Invasive species are a critical issue. While water sources with identified invasive species may be used, proper procedures must be followed before moving aircraft to a lake without invasive species. Invasive species requirements will be based on applicable states' information. In addition, appendix D (Environmental Considerations) provides guidance to avoid spreading aquatic invasive species between water sources.

7.6.3 Tactical

MESs are used similar to water suppressing helicopters; however, they move through the airspace at faster airspeeds and can use water sources further away from the incident. Separation and communication protocol must be established prior to "mixing" water scooper and helicopter operations.

MES can deliver water in varying drop patterns: Salvo, train (CL-215T), Auto 4, Auto Pair, single door drops (CL-415). They are effective working active flanks supporting ground crews, dozers, and retardant lines.

Additional MES tactical considerations include:

Drop Footprint: A salvo load is approximately 350 feet long and 80 feet wide. Trail drops are about 400 feet long x 70 feet wide.

Drop Height: Drop height ranges from 100 to 150 feet above the vegetation. Factors such as terrain, wind, and fire intensity will influence drop height. Ground crew clearance: It is best to work ahead of ground crews. When dropping in close proximity, personnel should be moved at least 200 feet from the drop area. Additional clearance may be needed in heavy canopy, when

MES pilots are not able to see ground crews. A dry run may be required to ensure positive line clearance.

Circuits/Turnaround Times: The natural layout of the typical circuit (flight pattern) is oval, with a pickup into the wind and a downwind drop on the fire. When suitable water sources are located near the fire drop area, a 90-second turn time is possible. Once established in the circuit, MESs usually work 500 feet AGL, unless crossing helicopter routes, which requires 500 feet of altitude separation.

Integrating with Other aircraft: MESs can be successfully integrated into suppression operations with other air resources. The preferred method is geographic separation of air resources. Suppression helicopters and MES aircraft can work together in a common target area with positive coordination between the aerial supervisor and the pilots. Aerial supervisors should use checkpoints to establish sequencing or hold aircraft as appropriate. Altitude separation should be used if crossing routes are required. The same separation protocols can be used mixing MES operations and airtankers. When supporting retardant, MES pilots should avoid dropping directly on retardant, unless specifically directed by aerial supervisors.

Initial Attack: MESs are best used as an initial attack resource, dispatched to attack the fire at the earliest stages of burning. They are dispatched in flights of two and can join with additional flights of water scooping aircraft to increase effectiveness. MESs are capable of delivering a large volume of water for direct attack. They can work effectively ahead of ground resources arriving on scene, for the best probability for success.

Direct Attack: MESs are most effective when working in coordination with ground resources. Scoopers can be assigned a ground contact, similar to helicopter operations when appropriate. Drops should be made directly on the fire's edge and may be dropped ahead of high fire activity to reduce the intensity of burning. Scoopers can be used to "hit" the head to stop forward progress, then work back towards the heal when appropriate. They are also well suited for hitting spot fires, slop-over, and ember mitigation.

Parallel Attack: In the event ground resources are delayed or drops are advancing faster than the crews, a parallel attack is effective. If the fire does not reach the drops in 30 to 45 minutes, plan reinforcement drops. If progress by ground crews is too slow, retardant aircraft may be a better option, with water used for cooling the line.

Indirect Attack: Indirect attack with water drops should be carefully considered for effectiveness. They can be an effective tool to support burn operations to wet the green side of a control line.

Aircraft Parameters and Specifications: See appendix E

Aerial supervisors and/or the scooper PIC must establish the scooper circuit based on the 5 C's:

Circuit: Define the routes and patterns into the scoop and on the drop.

Checkpoint: If the water source is outside the FTA, a checkpoint must be established. Checkpoints may also be utilized when water source is inside the FTA, if extended maneuvering is required due to terrain.

Clearance: Two clearances are required: A clearance through the airspace, and a drop clearance to ensure ground crew safety.

Copters: Determine the number of copters and type, model, configuration, color, & callsigns. Determine their target area, dip site(s), route(s,), and their actual working altitude (copter ceiling).

Communication & Separation**:** Determine the communication and separation protocol. Consider using fences and geographic separation, and frequency assignment based on proximity to other air resources.

7.6.4 Operational

MESs are no different than any other tactical aircraft with respect to Standard Target Descriptions, clearing the line, and drop evaluations.

Aerial Supervision**:** If Aerial Supervision is already on scene or assigned, the scooper pilots shall coordinate with them. If the MESs are used in the initial attack mode, they may arrive at the fire well ahead of ground forces. Local coordination with ground personnel is important due to frequent drops. The on-scene Aerial Supervision will assume flight following oversight of the scooper. See appendix F for additional Aerial Supervision requirements.

Daylight Operations**:** Water-dropping operations shall be limited to flight during daylight hours and under visual flight rule (VFR) conditions only. Daylight hours are from 30 minutes before official sunrise to 30 minutes after official sunset.

7.7 Daily Procedures

At the beginning of each operational period, the ATGS, Airtanker Base Manager, or AWSM will conduct a formal briefing. The briefing will consist of information pertinent to that duty day. During periods of flight operations, debriefings will also occur at the end of each period.

7.8 Flight Following

Flight Following is mandatory for all flights. Refer to the *National Interagency Standards for Resource Mobilization* for specific direction.

The pilot and dispatcher should determine the means of flight following before take-off, but this may also be accomplished once the aircraft is airborne.

Assigned dispatch will handle local flight following responsibilities, unless otherwise specified. If agency flight following cannot be established or maintained, and/or radio communications cannot be established or maintained between the MES and other aerial resources, or ground personnel, the flight will be terminated. Dispatch will follow local protocols for airspace de-confliction in jurisdictional boundary areas with adjoining cooperators/agencies before dispatching aircraft to those areas (reference aerial hazard maps).

- Agency FM radio capability is required for all mission flights.

- For mission flights, there are two types of Agency Flight Following: Automated Flight Following (AFF) and radio check-in. AFF is the preferred method of agency flight following. If the aircraft and flight following office have AFF capability, it shall be utilized. Periodic radio transmissions are acceptable when utilizing AFF.
- All dispatch centers designated for fire support shall have the ability to monitor AFF as well as the capability to transmit and receive on the “National Flight Following” and “Air Guard” frequencies.
- If AFF becomes inoperable the aircraft will normally remain available for service, utilizing radio/voice system for flight following. Each occurrence must be evaluated individually and decided by the COR/CO.

7.8.1 National Flight Following Frequency (168.6500 MHz)

The National Flight Following Frequency is used for flight following, dispatch, or redirection of interagency and contract aircraft. No other use is authorized.

MESs will establish/terminate flight following and confirm Automated Flight Following (AFF) on the National Flight Following frequency. All dispatch centers/offices will monitor the National Flight Following frequency at all times. A CTCSS tone of 110.9 must be placed on the transmit and receive sides of the National Flight Following frequency.

7.8.2 Flight Following Script

The following information is required every time a flight is initiated or continued with a dispatch center.

- Call Sign (Scooper 200)
- Departure Location
- Number of flight crew on board
- Fuel on board (hours)
- Estimated time enroute (ETE)
- Destination
- AFF Confirmation

8.0 Aviation Safety

8.1 Hazards

See appendix A for the MES risk assessment.

Aerial firefighting presents many hazards and risks associated with the dynamic nature of operations and the fire environment. Historic data identifies most hazards develop while

airborne and during times of communication complexities. Common hazards include but are not limited to:

1. Airspace congestion/aircraft proximity/co-altitude
2. Low visibility
3. Hazardous/masking terrain
4. Low level flight profiles
5. Weather/wind shift
6. Insufficient aerial supervision
7. Lack of communication
8. Communication blocking
9. Sense of urgency
10. Mission focus based on unreasonable expectations

This environment demands a significant level of situational awareness. Hazards such as these can overwhelm operators, causing loss of situational awareness, possibly leading to more complex/simultaneous hazards increasing risk and mishap potential.

8.2 Operational Risk Management

A Flight Risk Assessment Tool (FRAT) is required daily, prior to flight and must be updated as conditions change (i.e., weather, location, personnel on-board etc.).

8.3 Risk Refusal

Every individual has the right to turn down unsafe assignments. When an individual feels an assignment is unsafe, they also have the obligation to identify, to the degree possible, safer alternatives for completing that assignment.

The Incident Response Pocket Guide (IRPG), PMS 461 at https://www.nwcg.gov/publications/pms461 contains a process for properly refusing risk.

A “turn down” is a situation where an individual has determined he or she cannot undertake an assignment as given and is unable to negotiate an alternative solution. The turn down of an assignment must be based on assessment of risks and the ability of the individual or organization to control or mitigate those risks. Individuals may turn down an assignment because of safety reasons when:

- There is a violation of regulations, aviation policy or safe aviation practices.
- Communication issues.
- Airspace congestion or inadequate management.
- Aircraft capabilities, performance and/or limitations.

- Environmental conditions make the work unsafe.
- Pilot and crew lack the necessary qualifications or experience.

Individuals will directly inform the requestor that they are turning down the assignment as given.

For FS contracted MESs turning down an assignment, AWSMs will utilize the Federally Contracted Airtanker/Scooper Assignment Turndown form at: https://forms.office.com/g/8qfbTDVpTj.

If the assignment has been turned down previously and the requestor asks another resource to perform the assignment, he or she is responsible to inform the new resource that the assignment had been turned down and the reasons why. The refusal and additional request will be documented in IROC with any pertinent instructions. Furthermore, personnel need to realize that a “turn down” does not stop the completion of the assigned operation. The “turn down” protocol is an integral element that improves the effective management of risk, which provides timely identification of hazards within the chain of command, raises risk awareness for both leaders and subordinates, and promotes accountability.

If an unresolved safety hazard exists, the individual needs to communicate the issue/event/concern immediately to his or her supervisor and document as appropriate and report in the SAFECOM system.

8.4 Requirements

Safety of personnel and aircraft is of the utmost importance. All safety deficiencies shall be corrected and brought to the attention of the AWSM/FBO/ASM/Leadplane/ATGS, as appropriate with follow-up notification to the local aviation manager and the COR. A description of common hazards and mitigations follows.

8.4.1 Air

Follow FTA and Circuit protocols based on the PMS 505 NWCG Standards for Aerial Supervision, and PMS 518 Standards for Water Scooping Operations.

The AWSM and MES PIC will provide the ATGS an orientation to both the capabilities and operating procedures of the MESs when practical.

A HLCO (helicopter coordinator) may coordinate with an MES, but are not allowed to manage fixed wing assets, unless they are ATGS qualified.

8.4.2 Water

The AWSM, FAO/UAO, or vendor Water Source Coordinator may complete a Water Source Coordination Worksheet.

Flight crews shall observe sterile cockpit procedures during the scooping operation (see *Communications* below).

Flight crews shall continuously monitor water source suitability based on winds, terrain, public recreation, water depth, and hazards. Some water sources use may be limited due to changing wind conditions, or seasonal impacts such as river runoff debris in early season, or low water levels in the late season.

Water sources shall be a minimum 6 feet deep and preferably 10 feet deep. The MES aircraft needs adequate depth for a rejected scoop. Once the aircraft is stopped on the water, the flight crews will momentarily open the water doors to reduce the water load for subsequent takeoff.

Consider law enforcement coordination for high recreation water sources. Flight crews may communicate with the LEO boat patrol on Marine FM channels as needed.

8.4.3 Ground Personnel

Precautions for ground crews are no different than for conventional airtankers and helicopters:

- Clear personnel out of target area when drop is to be made.
- If personnel are caught in the target area when a drop is made, they should:
    - Hold hand tools away from body, lie face down with head toward oncoming aircraft with hard hat in place.
    - Grasp something firm to prevent being carried or rolled about by the dropped liquid.
    - Do not run unless escape is assured.
    - Get clear of dead snags, tops, and limbs in the drop area.
    - Use extra caution when walking on the slippery surfaces where wet suppressants cover the area.

Precautions associated with fueling, when not co-located at an airtanker base, are no different than for other aircraft:

- Fuel trucks will not approach an aircraft while the engine(s) is running.
- Fueling is the responsibility of the flight crew, and a crew member must be present during fueling.
- AWSM will not participate in fueling operations (marshalling/guiding fuel trucks or equipment, assist the fueler in any way, etc.) – only authorized personnel are allowed in the presence of fueling operations.
- Smoking is prohibited within 100 feet of aircraft fueling – fuel vapors may settle to the ground and travel long distances, posing a hazard well away from the fueling source.
- Auxiliary power units should be located well away from the fueling operation and should not be connected or disconnected from the aircraft during the fueling process. Transporting the ground support equipment to and from the aircraft is the responsibility of the FBO/Airport and aircraft vendor personnel. No agency personnel will be responsible for movement or storage of the ground support equipment.
- Fuel spills present an extremely hazardous fire potential and should be handled as such:

- Immediately report every spill to the appropriate authority and take appropriate remedial action.
- The location and size of a spill will dictate the type of cleanup (e.g., asphalt surfaces absorb fuel very quickly and are subsequently damaged, whereas concrete surfaces are not harmed).
- Clean up smaller spills as quickly as possible with absorbent pads or vermiculite (kitty litter), rather than washing them away.
- Place used absorbent materials in an appropriate hazmat container with a self-closing lid and then dispose of the materials properly.

Precautions associated with fueling, when co-located at an airtanker base, are no different than for other aircraft:

- Only qualified and/or authorized personnel are allowed on the ramp.
- Agency (includes agency, interagency, AD, cooperator, etc. assigned to the airtanker base) personnel will not participate in fueling operations (marshalling/guiding fuel trucks or equipment, assist the fueler in any way, etc.) – only authorized personnel are allowed in the presence of fueling operations.
- Review the NWCG Standards for Airtanker Base Operations as well as the local Airtanker Base Operations Plan and consult with the Airtanker Base Manager prior to fueling on the airtanker base ramp.

8.4.4 Communications

Checkpoints and fences shall be utilized when appropriate based on the PMS 505 and PMS 518 for positive separation and communication."

Flight crews must monitor and transmit on assigned AM and FM frequencies. Flight crews should monitor Primary and Secondary air to air frequencies to ensure situational awareness of aircraft working in adjoining working areas." (note: FM frequencies are used for air to air in R5 as "Air Tactics"

Flight crews and Aerial Supervision must confirm what frequency is being used and monitored. The flight crew coordination with aerial supervision will ensure balanced situational awareness and frequency overload

The Air Guard channel shall be able to be monitored at all times.

MES flight crews must maintain sterile cockpit during the scooping operation. Aerial supervisors must refrain from communications until the MES PIC calls “off the scoop."

8.4.5 Personal Protective Equipment

Contract flying personnel will adhere to Personal Protective Equipment requirements outlined in the contract and the Aviation Life Support Equipment Handbook.

Contract ground support personnel will adhere to company policies dictating personal protective equipment.

8.5 SAFECOM Reporting

The purpose of the SAFECOM is to report any condition, act, maintenance problem, or circumstance with personnel or the aircraft that has the potential to cause an aviation-related mishap. Submission of a SAFECOM is never a substitution for on-the-spot correction of a hazard or safety concern.

9.0 Water Scooper Information

9.1 Aircraft:

De Havilland CL-415 and CL-215T

Vendors: Aero Flite (CL-415s) and Bridger Aerospace (CL-215Ts)

Key Points:

- The CL-415 has a water capacity of 1621gallons while the CL-215T has a water capacity of 1408 gallons.
- The CL-415 and CL-215T are restricted by contract from using foam and/or water enhancers.
- The CL-415 and CL-215T can operate from airports with single wheel weight bearing of at least 36,000 pounds (S-36) and 5,000-foot runways. Aircraft are limited to airports at or below 10,000 pressure altitude.
- The CL-415 and CL-215T may scoop water up to 8,000 feet pressure altitude.
- The CL-415 and CL-215T scooping distances are dependent on altitude, temperature, and wind conditions. A rule of thumb is 1 mile at sea level and 2.5 miles at 8000 feet pressure altitude. Distances may be reduced with favorable wind and temperature."

Facilities:

- CL-415s and CL-215Ts are able to work from almost any airport because they are not departing with a payload, just the fuel on board.
- CL-415s and CL-215Ts are often mixed with retardant and helicopter operations. Aerial supervision shall set up and maintain separation and communication protocols. IA MESs may work with mixed resource operations if aerial supervision is ordered per the PMS 505. When conducting mixed aircraft operations, all participating resources must be aware and updated on routes, patterns, altitudes, and separation tools such as fences, checkpoints, and holding areas.

Terrain:

- The CL-415 and CL-215T may be used in all types of terrain. Some areas may be better suited for helicopter operations based upon safe exit paths off the drop.

Appendix A – Scooper Risk Assessment

Matrix for Rating Hazards Pre-Mitigation and Post-Mitigation

Mission risk assessment completed prior to mission approval
****Risk assessment hazards shall be re-assessed prior to mission engagement****
*****See appropriate management level for approval and dynamic flowchart decision-making tool*****

Risk Assessment Codes

RAC Value	Risk Category	Action Required
1	**Extremely High**	Stop, Mitigation Required
2	**High**	Mitigation Needed, Consider Stopping
3	**Medium**	Mitigation Recommended
4	**Low**	Possible Acceptance, Mitigation Optional

*Reference specific agency policy regarding action required based on risk category

Appropriate Management Level for Operational Risk Decisions

Risk Category/Value	*Fire Mission*	*Non-fire Mission*
Extremely High (1)	**Incident Commander or Operations Sections Chief**	**Line Officer / Manager**
High (2)	**Incident Commander or Operations Sections Chief**	**Line Officer / Manager**
Medium (3)	**Air Operations Branch Director**	**Mission Aviation Manager**
Low (4)	**Base Manager**	**Amphibious Water Scooper Manager**

Risk Assessment Worksheet

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **01 of 06**

Sub System(s)	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Mission – Policy	Operational/Mission goals may be unstated, unclear or conflict with policy.	Possible	Critical	High (2)	Conduct thorough briefings, ensure organization is in place, and adhere to interagency policy, procedures & Guides.	Unlikely	Critical	Medium (3)
Mission - Policy	FRAT (Flight Risk Assessment Tool) absent or not complete (Policy Deviation).	Possible	Critical	High (2)	Ensure FRAT is completed and approved at the appropriate level. Ensure the Amphibious Water Scooper Manager (AWSM) is involved in mission planning. If at any point during the briefing any or all participants are uncomfortable to continue, or the ORA/FRAT risk level exceeds the approved rating level, the mission will be cancelled or delayed until the issue(s) can be rectified. Ensure that all parties are available for mission briefings.	Unlikely	Critical	Medium (3)
Mission- Policy	When the aircraft and flight crews are performing operations for other agencies or cooperators where policy may differ.	Possible	Critical	High (2)	The Forest Service's policies, guidance, and standard operating procedures shall be followed	Unlikely	Critical	Medium (3)
Mission - Communications	Frequency management, cockpit overload, inadequate briefing, and/or loss of communication.	Possible	Critical	High (2)	Ensure pilots have adequate time for orientation/programming before mission flights. Conduct AARs and conduct periodic reviews of frequency lists and avionics equipment. Ensure positive communications are established	Unlikely	Critical	Medium (3)
Mission – Communications	Radio frequency congestion	Almost Certain	Critical	Extremely High (1)	Make alternative frequencies readily available and known. Order additional frequency, if needed. Coordinate with the ATGS, local Dispatch Center, and/or the Incident.	Possible	Critical	High (2)

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **02 of 06**

Sub System	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Mission – Communications	No communication between multi-engine water scoopers, ground personnel, and/or the ATGS.	Possible	Catastrophic	Extremely High (1)	Follow appropriate checklist and procedures. Do not drop on the fire line until confirmation the area is clear of ground personnel. If no contact can be established return to base.	Unlikely	Critical	Medium (3)
Mission – Personnel	Fatigue due to inadequate aircraft systems including noise, air conditioning, vibration, lack of autopilot, etc. (Pilots & Mechanics)	Possible	Moderate	Medium (3)	Ensure the AWSM monitors fatigue for rest/duty limitations per contract requirements. Pilot has the responsibility to stand down due to fatigue. Follow company SMS Program.	Possible	Moderate	Medium (3)
Mission - Personnel	Unqualified personnel working in or around the aircraft. Personnel not professionally trained or proficient with aircraft/equipment/mission. (Pilots & Mechanics)	Possible	Critical	High (2)	All personnel will be fully qualified to perform the duties associated with a position and will take part in the pre-mission brief and assignment of duties. Personnel unfamiliar with their assigned duty/role should ask for clarification. Emphasis on mentoring and training in conjunction with operations and emphasize hazard identification and communication methods.	Unlikely	Critical	Medium (3)
Personnel - Human Factors	Acceptance of high-risk missions as normal. Lack of CRM (Crew Resource Management), Task saturation or fixation, hazardous attitude. Poor mission analysis. Fatigue. Management pressure/mission driven sense of urgency. Unknown change in project objective. Experience level of air crew and vendor.	Possible	Catastrophic	Extremely High (1)	Conduct thorough risk assessments & brief/debrief. Pilot and flight crew trained in CRM and work together in mission planning. Conduct daily briefing and complete worksheet including real time ORA/FRAT. Ensure management does not place undue pressure or sense of urgency on flight crews. Ensure project objective has not changed and re-evaluate mission if changes occur.	Unlikely	Catastrophic	High (2)
Personnel – Human Factors	Lack of knowledge and experience in ramp operations.	Possible	Moderate	Medium (3)	Conduct standardized ramp management training.	Unlikely	Moderate	Low (4)
Personnel – Human Factors	Ground support personnel fatigue.	Likely	Critical	Extremely High (1)	Adhere to established work/rest policy and guidelines. Promote additional time off when possible.	Unlikely	Critical	Medium (3)

Risk Assessment Worksheet

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **03 of 06**

Sub System	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Aircraft - Airworthiness	Continuous airworthiness program may not take into consideration all factors of aircraft configuration and operation cycles. Examples include water scooping operation cycles, flap deployments, and effects of water on engines and propeller blades, which may not be accounted for in the continuous airworthiness program.	Likely	Critical	Extremely High (1)	Ensure all aspects of the maintenance schedule have addressed the short Water-air-Water (scoop) cycle for the water scooping mission. Require CAP Program for all contracted and agency owned scoopers.	Possible	Moderate	Medium (3)
Aircraft - Airworthiness	Original equipment manufacturer (OEM) maintenance inspection schedules may not address corrosion in the water scooping profile.	Unlikely	Moderate	Low (4)	Ensure the maintenance program addresses corrosion control.	Unlikely	Moderate	Low (4)
Aircraft – Airworthiness	Flying an aircraft in a non-airworthy condition. Failure to correct known defect.	Possible	Moderate	Medium (3)	Establish a method to inform the pilot of the aircraft's current maintenance status to include required inspection, overhaul, life limit, FAA regulatory and Airworthiness Directives. Utilize approved deferral processes, such as a minimum equipment list (MEL). Adhere to return to service procedures.	Unlikely	Moderate	Low (4)
Aircraft – Airworthiness	Component failure which may lead to an in-flight structural failure. Engine failure.	Possible	Critical	High (2)	Ensure the contractor is implementing manufacturer requirements using approved inspection technology through quality assurance checks. Maintain an operational load monitoring system and require contractors to use this data to ensure continued airworthiness program. Establish SOPs for crew coordination in emergency procedures.	Possible	Moderate	Medium (3)
Aircraft – Avionics	Avionics failure: Primary communication radio, avionics expert, or Traffic Alert/Collision Avoidance System (TCAS) fail.	Possible	Moderate	Medium (3)	Minimum equipment list established minimum requirement. Mission requirements as determined by the flight crew.	Unlikely	Negligible	Low (4)

Risk Assessment Worksheet

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **04 of 06**

Sub System	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Environment	Adverse wind speed / direction, thunderstorms, etc. Weather becoming less than VFR conditions	Possible	Critical	High (2)	Ensure flight crew obtains current forecast and updated weather briefings and continually monitors the wind speed and direction. If visibility or wind becomes unfavorable, postpone until conditions improve or delay to another day.	Rare	Critical	Medium (3)
Environment	Flying in Mountainous Terrain while focused on a low-level mission. Mishap is caused by poor visibility due to the smoke, sun, or shadows.	Possible	Catastrophic	Extremely High (1)	Carded and experienced pilots. Chosen aircraft will have enough performance to allow for more options flying in mountainous terrain. Recon of the areas to be treated will occur prior to the mission. All boundaries aerial hazards will be pre-identified. Division of tasks between pilots, ATGS and ground personnel communicating location relative to terrain.	Unlikely	Catastrophic	High (2)
Environment	Pre-identified scoop sites un-usable due to unfavorable wind conditions or environmental factors.	Possible	Critical	High (2)	If possible, ensure pilots are aware of possible scoop site before launching. Recon of water source before scooping to see if it is still unusable. Pilot has the authority to make the GO/NO GO decision.	Unlikely	Moderate	Low (4)
Environment – Mishap	Property damage or personnel injury due to loads dropped inadvertently in a congested area.	Possible	Catastrophic	Extremely High (1)	Avoid flight/drop patterns over congested areas, if possible. Perform drops at a safe level per the USFS Standards for Multi-Engine Scooper Operations Plan.	Possible	Critical	High (2)
Environment – Mishap	The aircraft scoops an excessive load resulting in poor performance or exceeding aircraft limitations.	Possible	Critical	High (2)	Establish a procedure for aborting or jettisoning a load (congested area, aquatic invasive species, etc.).	Unlikely	Moderate	Low (4)
Environment – Mishap	Collison with waterway users.	Possible	Catastrophic	Extremely High (1)	The Water Source Coordination Worksheet shall address the need for monitoring, observation, and possible enforcement of high use waterways during scooper operations.	Possible	Moderate	Medium (3)

Risk Assessment Worksheet

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **05 of 06**

Sub System	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Environment – Mishap	Bird strike to aircraft.	Possible	Critical	High (2)	Pilot ensures the scoop site is clear of birds prior to scooping. The Water Source Coordination Worksheet shall address the need for monitoring and observation of bird concentrations on high use waterways.	Possible	Moderate	Medium (3)
Environment – Mishap	Loss of control on waterway landing resulting in an accident. Not prepared for water survival.	Possible	Catastrophic	Extremely High (1)	Perform practice drills to avoid water/environmental hazards that could damage the aircraft (consider performing during proficiency flights). Have appropriate personal protective equipment readily available to the flight crew (PFD, Raft & Overwater Survival Kit).	Unlikely	Moderate	Low (4)
Environment – Mishap	Midair collision due to close proximity of multiple aircraft in the area of operations.	Possible	Catastrophic	Extremely High (1)	Perform proper mission planning and utilize "See and Avoid" tactics over congested areas. Ensure TFR's are established, practical and realistic for extended attack incidents, if applicable. Require Traffic Avoidance System (TAS) in USFS contracted Scooper aircraft. Agency conduct a strategic revision of the aerial supervision system to allow for enhanced command, control, and communications.	Possible	Moderate	Medium (3)
Management Oversight	Failure to recognize or correct unsafe conditions due to lack of familiarity by aerial supervision and ground-based personnel of water scooper operating characteristics in the fire environment.	Possible	Critical	High (2)	Conduct a flight profile evaluation for each make/model to identify flight characteristics, performance, and tactical applications. Educate ASMs and ATGS of operational considerations by aircraft capability. Review/revise existing Manuals, Handbooks, Guides, Risk Assessment, and Training.	Unlikely	Moderate	Low (4)
Management Oversight	Lack of qualified field personal for management and oversight of the Amphibious Water Scooper Program within the Agency.	Likely	Critical	Extremely High (1)	Develop a position (s) on the FAM Staff organization chart to be designated as the Amphibious Water Scooper Program Manager. Fund and hire the position as well as Amphibious Water Scooper Managers.	Possible	Moderate	Medium (3)

Risk Assessment Worksheet

System Being Evaluated: **Aviation: Multi-Engine Water Scoopers**

Risk Assessment Worksheet Page: **06 of 06**

Sub System	Hazard(s)	Pre-Mitigation			Mitigation(s)	Post Mitigation		
		Probability	Severity	Risk Level		Probability	Severity	Risk Level
Management Oversight	Aircraft accepting a dispatch to an environment beyond safe operating capability.	Possible	Critical	High (2)	Aircraft performance charts must be used to determine the ability of the aircraft to perform the mission. Include operating environment data in the dispatch orders (temperature/altitude, water source, etc.) Aircraft will not launch without environmental data on order.	Possible	Moderate	Medium (3)
Management Oversight	Dispatch order comes without regard to aircraft performance.	Possible	Critical	High (2)	Update Interagency Aviation Training course on aircraft capabilities and limitations to include the water scooper mission Provide access to the US Forest Service Standards for Multi-Engine Water Scooper Operations Plan.	Possible	Moderate	Medium (3)
Management Oversight	US Forest Service does not have internal carding capability for water scooper aircraft pilots. Currently it depends on DOI for support.	Possible	Critical	High (2)	The US Forest Service has developed within the Standardization Branch, personnel capable of providing oversight and carding for the appropriate flight crews, aircraft, and mission. All pilots will receive an evaluation and approval card prior to any flights (contractor and agency pilots).	Unlikely	Moderate	Low (4)
Training	Returning flight crews lack currency or proficiency in the fire environment during the start of the fire season.	Possible	Critical	High (2)	Ensure initial and recurrent training for water scooping has been accomplished by the contractor/agency prior to start of the flight operations. For contract and agency personnel, develop and implement fire simulation training in the flight environment including water scooper and fire operations tactics.	Unlikely	Moderate	Low (4)

*Final Risk Value is the overall risk of the mission/flight after all mitigations have been implemented.

Overall risk cannot be lower than the highest risk after mitigations. One high risk rating will result in the overall risk being high. It is not an average.

FINAL RISK VALUE: **High (2)**

Prepared By: Kelly Calahan **Title:** AWSM **Date:** October 31, 2025

Appendix B – Scooper Water Source Coordination Worksheet

SCOOPER WATER SOURCE COORDINATION WORKSHEET

NAME:		Last update:			
Latitude:*		*Longitude*:*		*Elevation:*	

*If specific portions of water body are to be used, determine lat/long for specific area, if not use center of water body

Operational Control:	
Owner:	
Name:	
Contact:	
Phone:	
Email:	

Law Enforcement Jurisdiction:	
Name:	
Contact:	
Phone:	
Name:	
Contact:	
Phone:	

CONTACT NEEDED PRIOR TO SCOOPING?

YES or NO

COORDINATION NEEDED PRIOR TO SCOOPING?

YES or NO

Fire Administration Information:	
Agency:	
Phone:	

Known Hazards:	
Structure(s):	
Water:	
Recreation:	
Other:	

Known Invasive Species:

Environmental Mitigations Needed Pre/Post Scooping: *Aircraft decontamination conducted per USFS guide to preventing aquatic invasive species transport by wildland fire operations (PMS 444).*

Comments:

Appendix C – Water Source Selection Process

A key element in operations is to thoroughly analyze the considerations involved in deciding which water sources to use in water scooping operations.

Being able to do this analysis prior to the need to use scoopers is essential.

Local units, along with the AWSM, are responsible for completing a “Scooper Water Source Coordination Worksheet” (appendix B) for each water source that may be used for water-scooping operations. These worksheets shall be reviewed and updated annually.

The Process

Upon receiving a dispatch to an incident, the AWSM shall review suitable water sources with the MES PIC and identify if specific coordination with the water source is required. The AWSM will coordinate with local units to determine if specific water source coordination is already established. To ensure effective coordination and operational safety, the AWSM shall act as the primary liaison with water sources. The AWSM’s technical expertise and familiarity with MES capabilities position them to manage water source interactions in close coordination with dispatch centers.

The final decision regarding safe utilization of a water source will rest with the MES PIC.

Water source authorities should be notified when operations cease, in order to reduce any recreation restrictions that may have been imposed.

Standard Nomenclature for Water Source Notification

The following standard script will be used for water source notification and a callback phone number will be provided to the water source authority with each request:

- This is (first and last name) with the Forest Service’s Amphibious Water Scoopers
- MES Aircraft Identifier Scooper (number goes here) has been dispatched to a fire near (geographic location).
- We will begin scooping operations at (name of water source goes here) in approximately (number goes here) minutes.
- Scooper (number goes here) will be returning to fill at the water (name of water source goes here)every (number goes here) minutes.

A water source survey will be conducted prior to any scooping operations to identify hazards and public recreation mitigation. Once coordination with the water source, and the source survey are complete, the final decision on suitability will rest with the MES PIC.

The AWSM should conduct an After-Action Review (AAR) with the water source authority as necessary, and any pertinent information should be updated on the Water Source Coordination Worksheet for future use.

Appendix D – Environmental Considerations

Firefighter and public safety is still the first priority, but aquatic invasive plants and animals pose a risk to both the environment and to firefighting equipment (some species can clog valves and pumps if equipment is not completely drained or treated). Avoidance and sanitation can prevent the spread of these organisms and help to ensure that firefighting equipment remains operational.

Forest Service fire managers developed these guidelines to help avoid the spread of aquatic invasive species.

All documents are available on the Region 4 Aquatic Invasive Species website: https://nas.er.usgs.gov/

Prevention

- Map the distribution of aquatic invasive organisms in watersheds where the operation will take place. An ArcMap project file and a geodatabase of species layers are available for download at: https://nas.er.usgs.gov/. It is not possible to ensure that invasive species are entirely absent. Personnel shall, however, obtain and reference current information on areas where invasive species are known to be present prior to conducting operations.
- Avoid transferring water between drainages or between unconnected waters within the same drainage.
- Do not dump water directly from one stream or lake into another.
- Avoid obtaining water from multiple sources during a single operational period unless the tanks have been hot rinsed or visual inspected due to the type of contamination. (see “Sanitizing Equipment,” below).
- If contamination of the gear with raw water or mud and plants is unavoidable, see “Sanitizing Equipment,” below.

Decontaminating Tanks

- Ideally and if feasible, sanitize equipment at these times:
    - Mobilization**:** Upon initial arrival to the incident and prior to use, unless documentation is presented to verify that the tanks were decontaminated prior to arrival on the incident.
    - During an Incident**:** If changing water sources, return to base if the tanks need to be decontaminated.
    - Demobilization (especially larger Type 1 or 2 incidents**):** After use, inspect, clean, and sanitize equipment. Documentation of cleaning can be issued by the AWSM that the MESs were cleaned. For engines and tenders, ground support

can provide the demobilization unit with documentation confirming that decontamination has occurred. This is typically a signed document with all boxes checked.

- External surfaces of all equipment that comes in contact with raw water
- Aircraft
- Tanks with accessible internal surfaces and minimal baffling (such as in CL-415 scooper aircraft)

Remove all visible plant parts and mud from external surfaces of gear and equipment. Power wash all accessible surfaces with clean water (water 140 °F or hotter for 5 to 10 seconds). Power washing will greatly reduce the likelihood that any aquatic invasives are present, and chemical treatment of external surfaces is not recommended.

Internal tanks of MES: Internal tanks that are accessible (with little or no baffling) are effectively sanitized with hot (140 °F or hotter) water from a hot washer. Allow spray to contact surface for 5 to 10 seconds. This method is recommended for MES tanks.

Internal tanks that are NOT accessible/have surfaces difficult to reach with hot water: Use of corrosive chemical disinfectants is not recommended in aircraft. Although rinsing equipment with clean (cool) water is not as effective as using hot (140 °F or hotter) water, plain water can flush unattached organisms (e.g., larvae, pathogens) from the system. Fill compartments with enough clean, preferably hot, water to provide adequate coverage on the base and sides and flush for 2 minutes. To the extent possible, drain all decontamination water from the compartments.

Appendix E – CL-415 Aircraft Parameters and Specifications

Engines	
• Type	Twin Pratt & Whitney Turboprop (PW123AF)
• Horsepower	2,380 SHP, 2502 ESHP
Fuel	
• Type	Jet Fuel
• Fuel Tank Capacity	1,531 U.S. gallons
• Fuel Economy	0.99 nautical miles/gallon (0.42 kilometers/liter)
Performance	
• Flight Time	4 hours (mission) 6 hours (ferry) (including reserve)
• Maximum Payload	13,500 pounds
• Maximum Take-off Weight	43,850 pounds
• Take-off Distance (Accelerate / Stop)	4,100 feet Conditions 30°C, 4000 MSL, no wind
• Rate of Climb	Loaded: 1,075 feet/minute Normal: 1,650 feet/minute Conditions 30°C, 4000 MSL, no wind
• Service Ceiling	20,000
• Maximum Cruise Speed	190 knots/hour
• Drop Speed	105-110 knots/hour
• Minimum Landing Distance	2,250 feet Conditions 30°C, 4000 MSL, no wind
Water Tanks	
• Capacity	1,621 U.S. gallons
• Tanking	2 Tanks/4 Doors Salvo, Auto 4,2,Pair, Man 1,2
Aircraft Specifications	
• Exterior Length	64.96 feet
• Wingspan	93.83 feet
• Height	29.75 feet

Appendix F – CL-215T Aircraft Parameters and Specifications

Engines	
• Type	Twin Pratt & Whitney Turboprop (PW123AF)
• Horsepower	2,380 SHP, 2502 ESHP
Fuel	
• Type	Jet Fuel
• Fuel Tank Capacity	1,531 U.S. gallons
• Fuel Economy	0.99 nautical miles/gallon (0.42 kilometers/liter)
Performance	
• Flight Time	4 hours (mission) 6 hours (ferry) (including reserve)
• Maximum Payload	12,000 pounds
• Maximum Take-off Weight	43,500 pounds
• Maximum Pick-Up Weight	45,250 pounds
• Maximum Landing Weight	34,400 pounds
• Take-off Distance (Accelerate / Stop)	3,700 feet Conditions 30°C, 4000 MSL, no wind
• Rate of Climb	Loaded: 1,200 feet/minute Normal: 1,800 feet/minute Conditions 30°C, 4000 MSL, no wind
• Service Ceiling	20,000
• Maximum Cruise Speed	190 knots/hour
• Drop Speed	105-110 knots/hour
• Landing Distance	2,250 feet Conditions 30°C, 4000 MSL, no wind
Water Tanks	
• Capacity	1,412 U.S. gallons
• Tanking	2 Tanks/2 Doors
Aircraft Specifications	
• Exterior Length	64.96 feet
• Wingspan	93.83 feet
• Height	29.75 feet