USDA

United States Department of Agriculture

Amphibious Water Scooper Aircraft

Operations Plan 2016

Forest Service

April 2016

REVIEW AND APPROVAL

Prepared by: **/s/ Kevin Merrill** **Date:** **1 April 2016**
Kevin Merrill, AWSA Program Specialist

The changes to the 2016 AWSA are documented in the digest below.

PLAN DIGEST

Date	Page	Section/ Chapter	Paragraph	Changes, clarification, edit
12/15	All			Removed "evaluation" from title and header/footer
4/16	1	Introduction	1st	Added verbiage regarding FS contracting two CL 415s
12/15	3	Notes Box	1st bullet	Removed "Scoopers are not Airtankers"
12/15	8	Mobilization and Repositioning	1st	Removed reference to 2015 MAP start date
4/16	8	Mobilization and Repositioning	1st	Added language pertaining to mobilization and repositioning of two aircraft
12/15	11	Considerations and Requirements	17th bullet	Removed obsolete web sites on water body lake depths
12/15	17	Program Evaluation	Entire Section	Realigned verbiage for consistency with existing AFUE guidance
4/16	18	Organization Chart	Flowchart	Updated flowchart to reflect current organizational personnel
4/16	19	Contract Measurement and Payment	Table	Updated table to reflect current contract pricing

Approved by: **/s/ Art Hinaman** **Date:** **04/13/16**
Art Hinaman, Assistant Director, Aviation

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Introduction

History

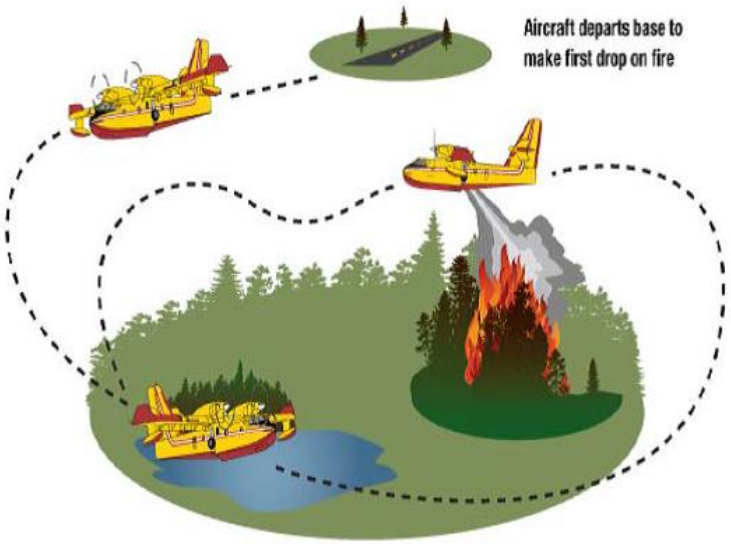
Department of Interior and State agencies have used water scoopers in fire suppression efforts in various parts of the United States, Canada, and Alaska. However, the U.S. Forest Service has limited operational experience with scooper aircraft. The Forest Service has contracted two CL-415 Amphibious Water Scooper Aircraft (AWSA).

Concept of Operations

While AWSA are a fixed-wing asset, their use is much more like Type 1 water-dropping helicopters. 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, and most pilots prefer it. (IASG 2011 Chapter 9 – Tactical Aircraft Operations – 112). 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 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 time will be slightly longer.



Advantages and Limitations

Advantages of AWSA include:

- Large volumes of water delivered to fire (i.e., when scoop site to fire is less than 10 nautical miles)
- Extended duration at fire scene (i.e., 2 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)
- Excellent at hot spotting and supporting personnel building line

Limitations of the AWSA include:

- Must have suitable water source nearby (i.e., effectiveness is very limited beyond 30 nautical miles)
- Not designed for line building
- Water-scooping operations require visual flight rule (VFR) flight conditions

NOTE:

- ***Operationally, they are very similar to heavy helicopters in their ability to operate from water sources close to fires (i.e., short turnaround and exclusive use of water)***
- ***Because they use water, they should primarily be used in a direct initial attack support role of ground suppression actions, but they can also be used for extended attack.***

Safety

Hazards

See appendix A for a risk assessment. For convenience, hazards associated with the use of AWSA are identified in four broad categories: those that occur in the air, on the water, on the ground, and those associated with communications. A description of common hazards in each category follows.

1. Air
    - Helicopters and water-scooping aircraft working near one another and with potential inadequate separation between helicopters and different makes and models of fixed-wing aircraft create complex and congested airspace during fire operations.
    - Aircraft freelancing
    - Water-scooping aircraft changes of patterns and headings
    - Helicopter refueling sites and landing zones; too close to water scooper aircraft flight routes
    - Inadequate or unfamiliar aerial supervision
    - Air Tactical Group Supervisor (ATGS) ability to maintain visual contact with aircraft and entire airspace
    - ATGS ability to coordinate and sequence safely while upholding remaining responsibilities
2. Water
    - Hazards on or beneath the surface
        - Floating foreign object debris
        - Stumps
        - Land features just under the water
    - People or vessels on the water
    - People in the approach or departure path
    - Aquatic invasive species
    - Wind speed and direction
    - Depth, width, and length of waterway
    - Approach and departure terrain features

3. Ground Personnel
    - The impact of water dropped by aircraft can injure firefighters.
    - Surfaces in areas covered by wet suppressants will be slippery for ground personnel to walk on.
    - Numerous hazards are associated with fueling and other ramp operations. These hazards should be reviewed during daily base briefings and operation risk management processes.
4. Communications
    - Failure of aircraft pilots to monitor the appropriate FM and AM frequencies.
    - Inadequate flight-following practices by pilots and/or dispatch.

Principles

Principles guiding the AWSA program are embodied by safety management systems (SMS). The objective of an SMS is to provide structure to control risk in operations. A formal, organized approach to hazard identification and risk management is essential in controlling risk to acceptable levels and minimizing property, financial, environmental, human, and societal losses.

The SMS concept is a comprehensive process to analyze system characteristics and engineer solutions to prevent mishaps from occurring. Aviation SMS is an approach to managing safety that includes the necessary organizational structures, accountabilities, policies, procedures, and assurances that risk controls are effective.

The foundation of SMS consists of four components: Policy, Risk Management, Assurance, and Safety Promotion. When fully implemented, SMS provides and promotes a positive safety culture – a culture that is informed, flexible, learning, just, and one which fosters reporting that captures the operational knowledge and experience of employees.

Adoption of SMS also brings the agencies into alignment with the minimum aviation safety standards agreed to internationally within guidelines of the International Civil Aviation Organization (ICAO 9859).

Requirements

Safety of personnel and aircraft is most important on all bases. All safety deficiencies shall be corrected and brought to the attention of the Ramp Manager/Airbase Manager/ATGS as appropriate with follow-up notification to the local aviation manager and the contracting officer's representative.

1. Air
    - Establish ingress and egress flight routes.
    - The AWSA Manager will provide the ATGS an orientation to both the capabilities and operating procedures of the scoopers when practical.

- Abort use of AWSA resources or acquire other aerial supervision such as a helicopter coordinator if the ATGS is uncertain about handling the workload.

2. Water
   - Complete the Scooper Water Body Coordination Worksheet (appendix B).
   - Observe sterile cockpit procedures during the scooping operation (see *Communications* below).
   - Continually observe water source conditions during scooping operations. Winds and water conditions can change hourly. A source that is usable one day may not be the next day. Some water sources may become unusable during the course of the season as water levels drop during the summer months.
   - Water sources shall be a minimum 6 feet deep and preferably 10 feet deep. The CL-415 will need 3 to 4 feet of draft if a water landing is necessary in the event of an emergency or mechanical problem. Additional depth is required to open the tank doors if it is necessary to release any portion of the load.
   - The water scooper pilot may request that the ATGS or lead plane observe a scoop from high and behind the scooper to look for muck and bottom debris that could be brought to the surface in the scooper's wake if the water depth is low.
   - Consider the need for law enforcement assistance to control recreational activity that could contribute to an accident.
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 hardhat in place.
       - Grasp something firm to prevent being carried or rolled about by the dropped liquid.
       - Not run unless escape is assured.
       - Get clear of dead snags, tops, and limbs in drop the area.
       - Use extra caution when walking on the slippery surfaces where wet suppressants cover the area.
   - Precautions associated with fueling are no different than for other aircraft:
     - The air attack / air tanker base manager/ramp manager/parking tender will see that fueling operations are performed in accordance with the Standards for Aircraft Fuel Servicing, NFPA 407.

- Fuel trucks will not approach an aircraft while the engine(s) is running – they will remain clear until the flight crew or parking tender signals the driver to approach.
- Fueling is the responsibility of the flight crew, and a crew member must be present during fueling.
- Base personnel will not participate in fueling operations – 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.
- "No Smoking" signs are posted and fire extinguishers are provided at each fueling location.
- 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.
- 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 <u>other ramp operations</u> are no different than for other aircraft:

- Only qualified and authorized personnel will be allowed on the ramp when water scoopers are operating.
- Ramp personnel will wear ear and eye protection, and high visibility clothing when working on the ramp.
- A fire extinguisher (20# Min. BC Rated) will be strategically placed on the ramp so personnel can reach it quickly. Instructions on how, when, and where to use the fire extinguisher will be coordinated between the pilot, AWSA Manager, and all employees working on the ramp, before operations begin.

4. Communications (*See additional requirements under flight following in the Operations Plan.*)
    - Require checkpoints for being off water and being off drop.
    - Require pilots to monitor and transmit on both AM air-to-air and FM air-to-ground tactical frequencies.
    - The ATGS must approve any requests to not monitor one of these radio frequencies.
    - The Guard channel shall be able to be monitored at all times.
    - Cease communications with the scooper during scooping operations, including approach and departure from the body of water, to allow the crew to concentrate on the pickup. The scooper pilot will call when up or off the water, which will signify to the ATGS that it's okay to talk.
5. Personal Protective Equipment
    - Contract flying personnel will adhere to Personal Protective Equipment requirements outlined in C.18 of the Exclusive Use Contract and the Aviation Life Support Equipment Handbook.
    - Contract ground support personnel will adhere to company policies dictating personal protective equipment

For additional information see:
Appendix A – Scooper Risk Assessment

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. A SAFECOM report will be filled out any time the pilot or base personnel feel the problem has the potential to cause an aviation-related mishap. These reports will be submitted to the Unit Aviation Officer for review and processing. Submission of a SAFECOM is never a substitution for on-the-spot correction of a hazard or safety concern.

Operations Plan

Pre-Use Requirements

The following requirements must be met before using AWSA assets:

1. Facilities. Airport approval and ramp space must be secured. (*See "Basing and Facilities" discussion below for specific requirements.*)
2. Acceptable Water Bodies. The agency AWSA Manager must pre-approve waterbodies to be used for operations. (*See specific requirements noted below under* "*Considerations*.")

3. Supporting Materials for Pilots. Maps, frequency lists, and other material required by the pilot must be secured.

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

Mobilization and Repositioning

AWSA are national resources. The AWSA will generally be kept together as a pair, however they may be separated based on strategic or tactical considerations. The Geographic Area Coordination Center where the aircraft are operating will make the scoopers available for wildland fire assignments when requested by the National Interagency Coordination Center. The aircraft will be dispatched by the Geographic Area Coordination Center or unit where they are located. Movement of these aircraft will be through the normal dispatch channels. The National Interagency Coordination Center will determine standby locations based on projected or current national needs. Coordination between the Geographic Area Coordination Centers and the AWSA Manager is essential to the successful movement and utilization of these resources. AWSA will be available seven days a week during their 210 day mandatory availability period. Water scooper dispatch response will be based on closest resources in the context of available water body sources and capability similar to heavy helicopters.

The local aircraft dispatcher will coordinate all repositioning and initial attack requests for the scoopers. Before aircraft are dispatched to an incident, the pilot will be provided with a Tactical Aircraft Resource Order. Aircraft will not be dispatched to an incident with unclear or incomplete orders. Minimum information required for mission flights includes a dispatch or ground contact and frequency. If other aircraft have been ordered or are currently over the incident, an air contact and air-to-air frequency are needed.

Aircraft repositioning within the jurisdictional boundaries or to neighboring cooperators will generally have an agency flight plan (radio check-in/automatic flight following (AFF)), if circumstances allow. 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. The AWSA Manager may ride on board the aircraft for repositioning (ferry) flights only, with prior approval from the Forest Service Washington Office.

Flights to and from incidents will not be below 500 feet above ground level. Scoopers will typically transit to and from the incident at lower altitudes when the water source is near the incident. Non-mission (ferry) flights or operations by multi-engine aircraft 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 for accuracy, particularly, navigational and communications information.

Scooper resources are identified in AFF as a yellow fixed-wing icon.

Basing and Facilities

The operating location could be anywhere in the United States. Boise, Idaho, will be the host administrative base for the CL-415. Scoopers can operate independent from retardant bases out of any approved airport that meets the following requirements:

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: CL-415s 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.

5. Avionics**:** 2 - VHF AM, 1- VHF –FM, AFF

6. Tanker Base Option**:** An air tanker base is not needed for these aircraft to operate from. They can land and operate from any airport meeting the requirements listed above. Therefore, you can base them, at times, closer to the fire than airtankers.

Considerations and Requirements

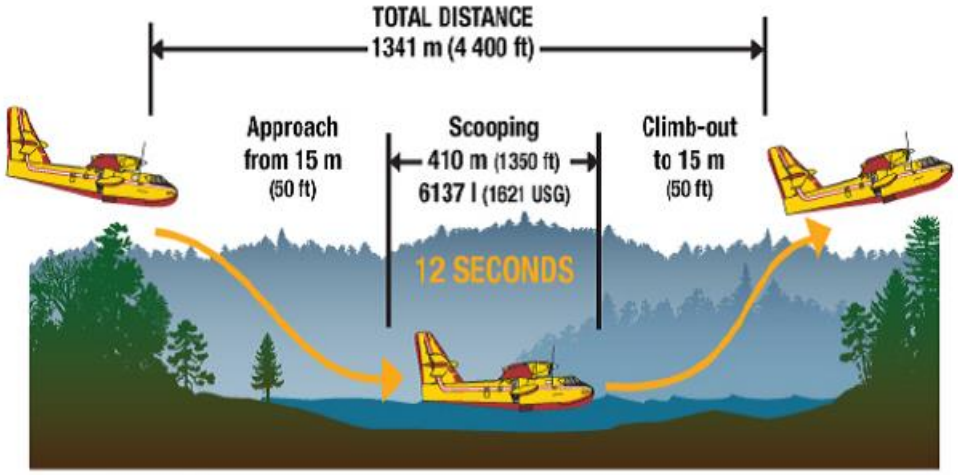
1. Water Body. Treat each body of water as an individual entity requiring examination, evaluation, and a decision made regarding its usage (see *appendix B – Water Body Coordination Work Sheet*). Jurisdictional approval is necessary before operations can begin at each water source. Each water source will have pre-established procedures identified relating to:

   - Water body ownership
   - Law enforcement
   - Lake safety
   - Primary contacts
   - Environmental issues
   - Cooperator use and agreements for use

   Appendix C summarizes the water body selection process. Additional water scooping considerations and requirements include:

   - CL-415s have a flight manual limitation of picking up water from sources that are above 8,000' Pressure Altitude.

- Regions and forests shall survey scooper water sources before ordering the aircraft.
- Scooper pilots will approve water sources prior to scooping. The AWSA Manager in collaboration with Aerial Supervision can facilitate the selection and evaluation of water sources with the scooper pilots and local fire and resource management.
- Aerial Supervision should scout the fire area for possible water sources prior to AWSA arrival.
- If there are concerns about lake depth and to help assess the water depth, Aerial Supervision should observe the first skim of the lake to see if any bottom mud is churned up.
- The CL-415 scoops at 80 knots and is on the water for approximately 10 to 12 seconds. The pickup water source should be a minimum of 1 mile long, depending on environmental conditions. The scooping path does not have to be straight, as the aircraft is maneuverable while scooping.



- Flight crews will generally avoid muddy or dark water due to potential underwater obstacles. Although AWSA 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.
- Factors such as wind, elevation, and surrounding terrain will have a bearing on the suitability of the water source. Consider that less than a full load can be scooped on slightly smaller lakes in some conditions.
- Changing conditions can affect ability to use AWSA from day to day, as with all aircraft.
- Water depth of at least 10 feet is preferred to allow the aircraft to land on the water if necessary; the minimum scooping depth is 6 feet.

- Information on bodies of water must be conveniently available to the pilot while flying. The following are known websites that may provide relevant information on bodies of water:

For additional information see:

Appendix B – Scooper Water Body Coordination Worksheet
And
Appendix C – Scooper Water Body Selection Process

2. Environmental. A full range of environmental considerations need to be explored before using scoopers. Invasive species are a critical issue. While bodies of water with identified invasive species may be used, proper procedures must be followed before using those aircraft on a lake without invasive species. Invasive species requirements will be based on applicable states' information. In addition, appendix D (Environmental Considerations) provides guidance on avoiding translocation of invasive species from one body of water to another.

3. Tactical. Water scooper pilots are very experienced at firefighting using these aircraft. Tactically, use scoopers like a heavy helicopter, but keep in mind they are fixed-wing assets. They drop water – a suppressant – and are very effective working the active flanks and the head of the fire. Slowing the fire down as it approaches a retardant line to reduce the intensity may be an appropriate tactic to consider. The CL-415 can deliver multiple different drop sequences depending on the fuel model or fire behavior.

   Additional AWSA tactical considerations include:

   - Aircraft Parameters and Specifications: See appendix E
   - Drop Foot Print: A salvo load is approximately 350 feet long and 80 feet wide. Trail drop is about 400 feet x 70 feet.
   - Drop Height: Drop height ranges between 100 and 150 feet, depending on factors such as direction of run (into wind versus downwind).
   - Clearance: When dropping directly in the vicinity of ground crews, personnel should be moved at least 200 feet to the side. When drops are made 1,000 feet or more in advance of the crews, no clearance is necessary, except to confirm no one is on the line.
   - 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. This is the most common and efficient circuit and preferred by most pilots. When suitable water sources are located near the fire drop area, a 90-second turn time is not uncommon. Once in the circuit on the fire, the CL-415 works 500 feet above ground level and lower.
   - Integrating with Other Aircraft: CL-415 scoopers can be successfully integrated into the suppression and logistical missions of other aircraft. The most common

and simple method is to assign different aircraft types to separate parts of the fire. Sustained bucket operations in the same target area as the scoopers can be accomplished, but that requires close coordination with Air Attack or a helicopter coordinator and the helicopters. CL-415 scoopers can support conventional airtankers by sequencing them in between retardant drops to cool the fire in advance of the retardant or to assist in holding the fire as it approaches the retardant. In other cases, use of AWSA needs to be in different areas than retardant aircraft, as the scooper's water drops have the potential to wash retardant off the fuels, and reduce retardant effectiveness.

- Initial Attack: *Scoopers are best suited as an initial attack tool*. These aircraft work best in tandem with other scoopers. They are most effective when they are dispatched to reach the fire at the earliest stages of burning. The scooper is capable of placing a large volume of water and is best suited for direct attack. Do not delay using these resources while awaiting arrival of ground resources
    - Direct Attack – Like other air resources, they are most effective when worked closely with ground resources. Use scoopers similar to large helicopters. Drops are made directly on the fire's edge. High-intensity fire may require drops to be made into the wind. Despite conventional thought, scoopers are well suited for hitting the head of small and emerging fires. Discuss this tactic with scooper flight crews.
    - 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 maybe a better option, with water used for cooling the line.***
    - Indirect Attack – The scooper's capabilities at indirect attack are limited. CL-415s are effective in supporting indirect tactics when used to reinforce retardant or other control lines, hot spotting, and knockdown of slop overs and spot fires.

Water scooper operations should take advantage of reduced fire activity in the early morning and late afternoon.

4. Operational. Scoopers are no different than other tactical aircraft with respect to Standard Target Descriptions, clearing the line, and drop evaluations. If possible, order water scoopers in pairs for increased effectiveness.

    - Aerial Supervision**:** If Aerial Supervision is already on scene or assigned, the scooper pilots shall coordinate with them. If the scooper aircraft is 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 (i.e., quick turns). To reduce scooper pilot workload when the scooper is flying short turns from the water source to the incident, 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.

NOTE: Water scoopers shall not be included in air tanker rotation procedures or policies. Water scoopers will not be loaded with retardant, foam, or gel.

Daily Procedures

At the beginning of each operational period, the ATGS, Airtanker Base Manager, or AWSA Manager will conduct a formal briefing using the format found in exhibit I-2 of the *Interagency Airtanker Base Operating Guide*. 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.

Flight Following

Aircraft involved in mission flights, are required to flight follow. The two acceptable methods of mission flight following are Agency Radio Check-In and Automated Flight Following (AFF). The pilot and dispatcher will 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, or radio communications cannot be established or maintained between the AWSA and other aerial resources, or ground personnel, the flight will be terminated. Dispatch will follow local *Airspace Boundary Plan* protocols for airspace de-confliction in jurisdictional boundary areas with adjoining cooperators/agencies before dispatching aircraft to those areas (reference aerial hazard maps).

1. Agency Radio Check-In. (See Flight Management Procedures - in the *National MOB Guide.*)

   - Radio flight following requires 15-minute check-ins with dispatch or other controlling entity.
   - Aircraft engaged in mission flights will relay departure time/estimated time enroute (ETE)/flight heading information/fuel on-board/number of people on-board following take-off and will report 15-minute check-ins thereafter. Fifteen-minute check-ins require the aircraft's current position (latitude and longitude) with a landmark if possible, heading, and an updated estimated time of arrival (ETA).
   - When over the incident, the aircraft will remain in contact with the appropriate party, i.e., air attack, lead plane, incident commander, or other assigned personnel.

- Arriving aircraft unable to establish communications on assigned incident frequencies will not enter incident airspace and will follow Fire Traffic Area standards.
- If, during initial attack, there are no contacts or resources on the incident, the aircraft will continue to flight follow with dispatch.
- When aircraft missions cross jurisdictional boundaries, a positive hand-off must be made between the sending dispatch and the receiving dispatch. The receiving dispatch will notify the sending dispatch via telephone confirming the aircraft's arrival. The pilot is responsible for accomplishing the hand-off when supporting neighboring cooperators. If the aircraft has a loss of communications with the sending dispatch, the pilot will request that the receiving dispatch/incident notify the sending dispatch of the hand-off.

2. Automated Flight Following. AFF is a satellite/web-based system that allows the dispatcher to monitor aircraft location on a computer screen. When used, AFF is intended to preclude the requirement for 15-minute radio check-ins. AFF essentially provides the dispatcher real-time information regarding the aircraft's location, heading, airspeed, altitude, and flight history. AFF also reduces the pilot workload and the amount of radio traffic.

   - Before using AFF, the dispatcher must verify that the aircraft is displayed on the computer screen and must be capable of monitoring the web page at 15-minute intervals with radio check-in procedures.
   - Aircraft using AFF flight following must also monitor the appropriate agency flight-following radio frequency during the flight. If AFF capability is lost during the flight, flight following will revert to 15-minute radio check-in procedures.
   - If the flight will cross local dispatch boundaries, the originating dispatch will contact the receiving dispatch and establish which dispatch center will have flight-following responsibilities once the boundary is crossed. This information must be communicated and understood between dispatch centers and aircraft.
   - When aircraft are initially off the airport and no longer under sterile cockpit requirements, the pilot will perform an initial radio check-in with dispatch to confirm AFF is operating, as well as relay necessary departure information (ETE/ETA, fuel on board, number of people on board, etc.).
   - When the aircraft has completed its mission and landed, the pilot or AWSA Manager will notify dispatch.

Maintenance

Due to the nature of their mission, scoopers require frequent inspection and maintenance. The AWSA Manager 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 that would require the

aircraft to be unavailable for use for a short time. The AWSA Manager must approve such requests.

- "Scheduled maintenance" does not normally require action by agency personnel, just appropriate entries in the aircraft maintenance log, aircraft contract diary, and/or air attack base daily log. Agency personnel will become involved if the maintenance requires an aircraft to be placed in "unavailable" status and/or major parts are changed out. Communication between the AWSA Manager and contractor personnel is essential. The Manager will communicate maintenance information to the designated agency aircraft Maintenance Inspector.
- Unscheduled maintenance must be reported to an Airworthiness Maintenance Inspector (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/air attack base daily log. 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.
- Aircraft maintenance and engine run-ups at the air attack 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.

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Program Evaluation

Aerial Firefighting Use and Effectiveness (AFUE) Study

Aerial Firefighting Use and Effectiveness (AFUE) is a chartered study through the United States Forest Service (FS), Fire and Aviation Management. This study is an exploration of critical questions; questions such as: Where, When, Why, How, and How Well are aerial firefighting resources being used? AFUE products are intended to assist and inform, both aerial firefighting in particular, and wildland fire management in general.

Process

The AFUE study employs a three-pronged approach to data collection. At the national and seasonal scale, existing databases containing aviation operations and use records are used to compile overall use trends.

Key Points

- The AFUE study will provide key information to define and track performance metrics for aerial suppression aircraft.
- The study may lead to improvements in fleet planning, mission selection, training, and potential lower overall aviation and fire suppression costs.
- AFUE collects aircraft drop location and information including the objectives and outcomes for each drop. Data also includes terrain slope, fuel type, fire behavior, weather conditions, and other factors that may influence drop effectiveness.
- By documenting the objectives, conditions and outcomes of individual drops, AFUE provides a means to identify and track the performance of specific aircraft types.
- All AFUE missions are coordinated through geographic coordination centers, local dispatch centers and the on-scene local Incident Command, and will not influence operational decisions or outcomes.
- Four data collection modules consist of three operationally qualified, self-sufficient firefighters per module.

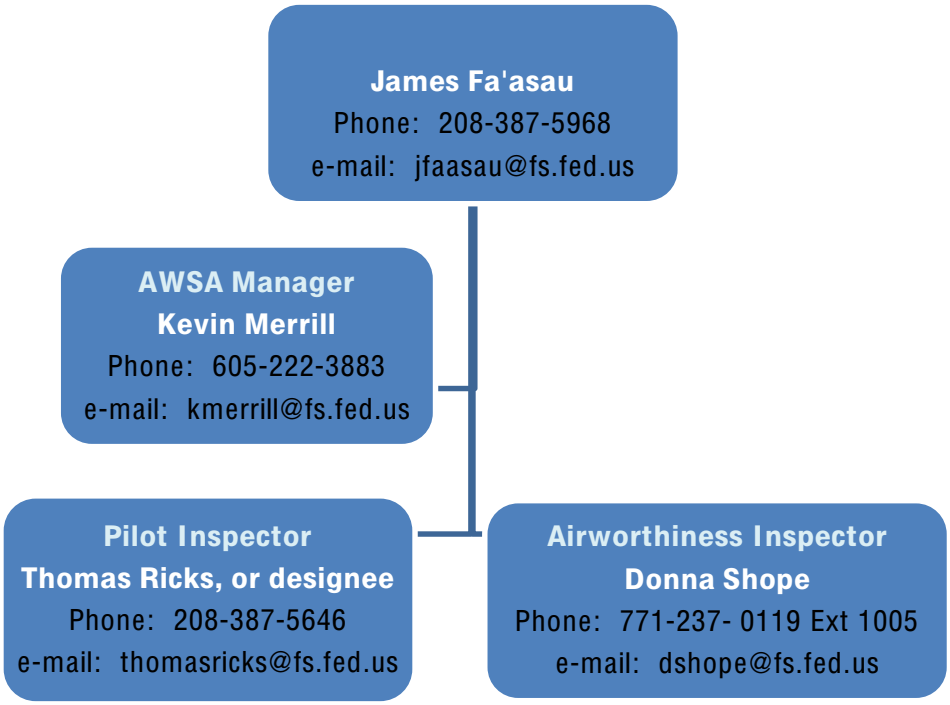
Findings

The AFUE team will coordinate, collect, and disseminate findings. Further information can be obtained from Zachary Holder, Program Coordinator, Missoula Technology and Development Center.

Administration

Organization

James Fa'asau will lead the overall AWSA program. A manager (minimally qualified as either a Helicopter Manager or SEAT Manager) will be assigned and remain with the aircraft for the duration of the CL-415 Mandatory Availability Period (MAP). The Pilot Standardization and Airworthiness Branch Chiefs for the AWSA identified a Pilot Inspector and Airworthiness Inspector. An organization chart, including contact information follows:



Ordering and Contract Information Outside of Contract Mandatory Availability Period

Exclusive use contracts can be extended beyond the agreed to term up to 30 days. If requirements exceed the existing contract, the Forest Service contracting officer must generate a new task order.

Contract Measurement and Payment

The following information pertains to contract measurement and payment:

Aero Flite Inc. CL-415	2016 EU Rates Base Year 1	2017 EU Rates Base Year 2	2018 EU Rates Base Year 3	2019 EU Rates Base Year 4	2020 EU Rates Base Year 5
Flight Rate Dry	$13,299/hr.	$13,698/hr.	$14,109/hr.	$14,532/hr.	$14,968/hr.

- The contractor provides a minimum of two pilots and one mechanic per aircraft.
- Flight time for payment will begin at the contractor's point of hire or the contractor's base of operations, whichever is closest to the incident.
- Seven-day staffing is required. Aviation Business System (ABS) shall be used to document use and initiate payment.

The AWSA Manager shall log availability, flight use time, non-availability, fuel charges, and gallons dropped daily.

Appendix A – Scooper Risk Assessment

Matrix for Rating Hazards Pre-Mitigation and Post-Mitigation

						Severity				
						No effect **no damage**	**No lost time injury** **Minor damage**	**Loss time, 1-3 days** **Damage < 3 days**	**Loss time, 4+ days** **Major Damage**	**Death/Perm. Dis.** **Loss of Aircraft**
			Flt			Very Low	Low	Moderate	High	Extreme
	Time	Missions	Hours	Probability		1	3	9	12	15
Prob. or Sign.	5 Seasons	315	750	**Very Low**	1	**2**	**4**	**10**	**13**	**16**
	Season	126	300	**Low**	2	**3**	**5**	**11**	**14**	**17**
	Monthly	42	60	**Moderate**	3	**4**	**6**	**12**	**15**	**18**
	Weekly	8	16	**High**	4	**5**	**7**	**13**	**16**	**19**
	Daily	3	4	**Extreme**	5	**6**	**8**	**14**	**17**	**20**

Table 1 - Airworthiness System

Airworthiness System																	
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Continued Airworthiness	AW1	Component failure that may lead to an in-flight structural failure.	Low	Extreme	Extreme	AW1M1	Ensure the contractor is implementing manufacturer requirements using approved inspection technology through quality assurance visits.	Very Low	High	High	Moderate	High	Better	$12,000	Yes
						AW1M2	Maintain an operational load monitoring system and require contractors to use this data to assure continued airworthiness program.	Very Low	High	High	High	High	Better	$200,000	Yes
	AW2	Engine failure (Hull aircraft Twin engine).	Low	Moderate	Moderate	AW2M1	Utilize highly experienced pilots in the aircraft make, model and configuration.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						AW2M2	Utilize pilots trained in crew resource management (CRM) or cockpit resource management as appropriate.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						AW2M3	Establish standard operating procedures for crew coordination in emergency procedures.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						AW2M4	Utilize standard aircraft carding procedures for inspecting aircraft along with Quality Assurance Reviews.	Very Low	Moderate	Moderate	Low	High	Best	$5,000	Performed by DOI
	AW3	Engine failure (Float aircraft Single engine).	Low	High	High	AW3M1	Utilize highly experienced pilots in the aircraft make, model and configuration.	Very Low	High	High	Low	High	Best	$0	Yes
						AW3M2	Utilize pilots trained in crew resource management (CRM) or cockpit resource management as appropriate.	Very Low	High	High	Low	High	Best	$0	Yes
						AW3M3	Establish standard operating procedures for crew coordination in emergency procedures.	Very Low	High	High	Low	High	Best	$0	Yes
						AW3M4	Utilize standard aircraft carding procedures for inspecting aircraft along with Quality Assurance Reviews.	Very Low	High	High	Low	High	Best	$5,000	Performed by DOI & Agency Pilots (Beavers)
	AW4	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 engine and propeller blades, which may not be accounted for in the continuous airworthiness program.	Moderate	High	High	AW4M1	Ensure all aspects of the maintenance schedule have addressed the short Water-air-Water (scoop) cycle for the water scooping mission.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						AW4M2	Require CAP Program for all Contracted and agency owned scoopers.	Very Low	Moderate	Moderate	High	High	Better	$100,000	No
	AW5	Original equipment manufacturer (OEM) maintenance inspection schedule may not address corrosion in the water scooping profile.	Low	Low	Low	AW5M1	Ensure the maintenance program addresses corrosion control. (415)	Very Low	Very Low	Very Low	Low	High	Best	$0	Yes
			Moderate	Moderate	High	AW5M2	Ensure the maintenance program addresses corrosion control. (Beaver/802)	Very Low	Low	Very Low	Low	High	Best	??	??
	AW6	Flying an aircraft in a non-airworthy condition.	Low	Moderate	Moderate	AW6M1	Establish a method to inform the pilot of the aircraft current maintenance status to include required inspection, overhaul, life limit, FAA regulatory and Airworthiness Directives.	Very Low	Moderate	Moderate	Low	High	Best	$0	Check Beaver Status
	AW7	Failure to correct known defect.	Moderate	Moderate	High	AW7M1	Utilize approved deferral processes, such as a minimum equipment list.	Low	Low	Low	Low	High	Best	$0	Yes
						AW7M2	Adhere to return to service procedures.	Low	Low	Low	Low	High	Best	$0	Yes

Table 2 – Aircraft System is no longer included because aircraft risks were absorbed into other areas covered in remaining tables.

Table 3 - Human Factors System

Human Factors System																
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Flight Crew	HF1	Fatigue due to inadequate aircraft systems including; noise, air conditioning, vibration, lack of autopilot, etc. (Dual Pilot)	Low	Moderate	Moderate	HF1M1	Ensure Manager monitors fatigue for rest and duty limitations as listed in acquisition document. Pilot has the responsibility to stand down from fatigue. Follow Company SMS Program outline.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
	HF2	Fatigue due to inadequate aircraft systems including; noise, air conditioning, vibration, lack of autopilot, etc. (Single Pilot)	Moderate	Moderate	High	HF2M1	Ensure Manager monitors fatigue for rest and duty limitations as listed in acquisition document. Pilot has the responsibility to stand down from fatigue. Follow Company SMS Program outline.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
	HF3	Fatigue due to inadequate aircraft systems including; noise, air conditioning, vibration, lack of autopilot, etc. (Agency Pilot)	Moderate	Moderate	High	HF3M1	Adhere to agency policy (5700), determine Quality Assurance and oversight role to monitor flight crew (Beavers-FAO). Pilot has the responsibility to stand down from fatigue.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes but need to check Beaver Status
	HF4	Flight crew operating under the influence (medications, alcohol, etc).	Low	Moderate	Moderate	HF4M1	Develop and provide self-administered preflight risk assessment for the flight crew to include illness and medications. (GAR)	Very Low	Low	Low	Low	Moderate	Better	$10,000	Not for Agency
						HF4M2	Ensure Manager monitors for possible fit-for-duty issues. Pilot has the responsibility to disclose self medicating.	Very Low	Moderate	Moderate	Low	Moderate	Better	$0	Yes for contractors unsure of Agency
Maintenance Crew	HF5	Improperly maintained aircraft due to fatigue or self medication.	Moderate	High	Extreme	HF5M1	Ensure Manager monitors for possible fit-for-duty issues, enforce rest and duty day limitations. Mechanic and ground personnel has the responsibility to disclose self medicating. Follow Company SMS Program outline.	Low	Moderate	Moderate	Low	Moderate	Better	$0	Yes for contractors unsure of Agency
Ergonomics	HF6	Mission specific equipment and controls location not ergonomically placed may distract aircrew.	Low	Moderate	Moderate	HF6M1	Develop contract language/policy to require standardization of controls, switches, guages and all cockpit equipment be standard for all like platforms from the same company to the extent possible.	Very Low	Low	Very Low	Low	Moderate	Better	$0	Yes but need to check Beaver Status

Table 4 - Administration and Policy System

Administration and Policy System																	
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Agency Culture	AP1	Aircraft accepting a dispatch to an environment beyond safe operating capability.	Moderate	High	Extreme	AP1M1	Aircraft performance charts must be used to determine the ability of the aircraft to perform the mission.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						AP1M2	Include operating environment data in the dispatch orders (temperature-altitude, scoop sites, etc). Aircraft will not launch without environmental data on resource order.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
	AP2	Dispatch order comes without regard to aircraft performance.	High	Moderate	High	AP2M1	Implement the Change Management Plan for the waterscooper evaluation project. Include all scooper aircraft in 2016 ops plan.	Moderate	Moderate	High	Low	High	Best	$0	Yes for 415 No to all others
						AP2M2	Update the Interagency Aviation Training course on aircraft capabilities and limitations to include the water scooper mission.	Moderate	Moderate	High	Moderate	High	Better	$40,000	No
						AP2M3	Aircraft performance charts must be used to determine the ability of the aircraft to perform the mission.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
Management Oversight	AP3	U.S. Forest Service does not have internal carding capability for water scooper aircraft pilots. Currently depend on DOI for support.	Moderate	Moderate	High	AP3M1	Develop within the Standardization Branch, personnel capable to provide oversight and carding for the flight crew that is appropriate to the aircraft and the mission. All pilots will recieve an evaluation and approval card prior to any flights (contractor and agency pilots).	Very Low	Moderate	Moderate	Moderate	Very High	Best	$50,000	No
						AP3M2	Invest in minimum of 2 pilots from Standardization Branch to attend Bombardier pilot training to be able to support the agency goal of pilot carding and evaluation of contract pilots.	Very Low	Moderate	Moderate	Moderate	Very High	Best	$50,000	No
	AP4	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.	Moderate	High	Extreme	AP4M1	Conduct a flight profile evaluation for each make and model to identify flight characteristics, performance and tactical applications.	Low	High	High	Low	High	Best	$0	Ongoing, performed by the Scooper Manager
						AP4M2	Educate Aerial Supervision Modules and Aerial Tactical Group Supervisors of operational considerations by aircraft capability.	Low	Moderate	Moderate	Low	Very High	Best	$10,000	Ongoing, performed by the Scooper Manager
						AP4M3	Review and revise existing Manuals, Handbooks, Guides, Risk Assessment and Training.	Low	Moderate	Moderate	Low	High	Best	$10,000	Ongoing, performed by the Scooper Manager,
						AP4M4	Implement Change Management Plan for the water scooper evaluation project.	Low	Moderate	Moderate	Low	High	Best	$0	Ongoing
	AP5	Lack of Qualified Field personnel for management and oversight of the Scooper program within the Agency	Moderate	High	Extreme	AP5M1	Develop a position on the FAM Staff organization chart to be designated as the Scooper Program Manager.	Low	Moderate	Moderate	Low	High	Best	$0	No
						AP5M2	Fund & Hire Scooper Program Manager	Low	Moderate	Moderate	Moderate	Very High	Best	$120,000	No

Table 5 - Mission Environment System

Mission Environment System																	
			Pre-mitigation				Mitigation	Post-mitigation			Benefit~Cost					
Sub-System	ID	Hazards	Prob	Severity	Rating	ID		Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Mission Flight Profiles	ME1	Midair collision due to close proximity of multiple aircraft in the area of operations.	Low	Extreme	Extreme	ME1M1	Agency conduct a strategic revision of the aerial supervision system to allow for enhanced command, control and communications.	Very Low	High	High	Moderate	High	Better	$50,000	Will be added to contracted A/C
						ME1M2	Perform proper mission planning and utilize see and avoid tactics over congested areas.	Very Low	High	High	Low	Moderate	Better	$0	Yes
						ME1M3	Establish tactical airspace command, control and communication consistent with the complexity of the operation (utilize Scooper A/C on specific areas of the incident).	Very Low	High	High	Low	High	Best	$0	Yes
						ME1M4	Ensure that Temporary Flight Restrictions are established, practical and realistic for extended attack incidents if applicable.	Very Low	High	High	Low	High	Best	$0	Yes
						ME1M5	Ensure that Temporary Flight Restrictions are validated for each operational period and are adjusted as needed.	Very Low	High	High	Low	High	Best	$0	Yes
						ME1M6	Require Traffic Avoidance System (TAS) in all FS contracted Scooper aircraft.	Very Low	High	High	Low	Very High	Best	$0	Yes
						ME1M7	Ensure Notice to Airman (NOTAM) for Temporary Flight Restrictions are posted in briefing areas and pilots are checking prior to flight.	Very Low	Moderate	Moderate	Low	Moderate	Better	$0	Yes
						ME1M8	Establish flight routes in and out of the incident.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME1M9	Follow interagency procedures for military airspace de-confliction performed via Dispatch.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME1M10	Provide public education on TV and radio campaign to tell the aviation public to avoid areas where there is smoke and at water scooping operations.	Very Low	Moderate	Moderate	Moderate	Very High	Best	$50,000	Created posters for placement around water bodies. Would like to have a video made to promote FS Scooper Ops.
						ME1M11	Utilize Part 91 for operating at non-towered airports when applicable.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes

Table 5 - Mission Environment System (continued)

Mission Environment System																	
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Mission	ME2	Controlled flight into towers, wires, trees, etc.	Low	Moderate	Moderate	ME2M1	Post updated hazard map(s), communicate with field personnel and pilots for additional hazard map updates.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME2M2	Always perform high-level reconnaissance before transition to low-level operations.	Very Low	Moderate	Moderate	Low	Very High	Best	$0	Yes
						ME2M3	Utilize area charts and hazards maps prior to entering unknown area.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME2M4	Utilize aerial supervision assets and seek input from local personnel.	Very Low	Moderate	Moderate	Low	High	Best	$0	Yes
	ME3	Property damage or personnel injury due to load dropped inadvertently in a congested area.	Low	Moderate	Moderate	ME3M1	Avoid flight and drops over congested areas if possible. Perform drops from safe heights as requred in the Scooper Operations Plan.	Very Low	Low	Very Low	Low	High	Best	$0	Yes
						ME3M2	In routinely used areas, establish flight paths and mark them on hazard maps.	Very Low	Low	Very Low	Low	High	Best	$0	Yes
						ME3M3	Scoop sites should be established in areas to minimize flights over congested areas.	Very Low	Low	Very Low	Low	High	Best	$0	Yes
	ME4	The aircraft scoops an excessive load resulting in poor performance or exceeding aircraft limitations.	Moderate	Moderate	High	ME4M1	Ensure proper mission planning i.e. proper performance planning.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME4M2	Establish a procedure for aborting or jettisoning of a load (congested area, foam, aquatic invasives etc.).	Low	Low	Low	Low	High	Best	$0	Yes
						ME4M3	For AT-802, require a physical safeguard to limit the tank capacity.	Low	Low	Low	Moderate	High	Better	$40,000	Not developed at this time
	ME5	Mishap caused by poor visibility due to smoke, sun, shadows.	High	High	Extreme	ME5M1	Time missions for optimal visibility, obtain feedback from on-site personnel and pilots regarding conditions, utilize aerial supervision and empower pilot to abort mission.	Moderate	Moderate	High	Low	High	Best	$0	Yes
	ME6	Pilot unfamiliar with the operating area.	Moderate	Moderate	High	ME6M1	Pilot is briefed on the scoop site operating plan that pre-identifies usable scoop sites and known hazards.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME6M2	Conduct proper pre-mission aerial familiarity flight.	Very Low	Moderate	Moderate	Moderate	Very High	Best	$90,000	Ongoing
	ME7	Pre-identified scoop sites un-usable due to unfavorable wind conditions or environmental factors.	Moderate	Moderate	High	ME7M1	Pilot is briefed on the scoop site operating plan that pre-identifies usable scoop sites.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME7M2	Pilot analyze pre-identified usable scoop sites to ensure it is still usable.	Low	Low	Low	Low	High	Best	$0	Yes
						ME7M3	Scooper Operations plan reinforces the pilot's authority to make the go/no-go decision on the suitability of the pre-identified sites. (2016 will encompass all Scoopers)	Very Low	Low	Very Low	Low	High	Best	$0	Yes for 415, will include all other A/C in 2016 Ops Plan

Table 5 - Mission Environment System (continued)

Mission Environment System																
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Mission	ME8	Collision with waterway user.	Low	high	High	ME8M1	Pilot ensures the scoop site is clear of waterway users prior to scooping.	Very Low	High	High	Low	Very High	Best	$0	Yes
						ME8M2	The scoop site operating plan shall address the need for monitoring, observation & possibly enforcement of high use waterways during scooper operations.	Very Low	High	High	Low	High	Best	$0	Ongoing
						ME8M3	Develop a scoop site operating plan that pre-identifies usable scoop sites.	Very Low	High	High	Low	Very High	Best	$0	Ongoing
						ME8M4	Require installation of siren to be used in high use water areas.	Very Low	High	High	Moderate	High	Better	$25,000	No, need to add to contracts &
						ME8M5	Provide public education and signage on pre-identified usable scoop sites.	Very Low	High	High	Low	High	Best	$0	Yes
	ME9	Bird strike to aircraft.	Moderate	Moderate	High	ME9M1	Pilot ensures the scoop site is clear of birds prior to scooping.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME9M2	The scoop site operating plan shall address the need for monitoring and observation of bird concentrations on high use waterways.	Low	Moderate	Moderate	Low	Moderate	Better	$0	Yes
						ME9M3	Ensure use of siren prior to and/or during scoop filling operations.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
	ME10	Loss of control on landing on waterway resulting in an accident.	Moderate	Moderate	High	ME10M1	Perform practice/drills for avoiding water/environmental hazards that could damage the aircraft (consider performing during proficiency flights).	Low	Moderate	Moderate	Low	Very High	Best	$0	Yes
						ME10M2	Utilize qualified amphibious pilots.	Very Low	Moderate	Moderate	Low	Very High	Best	$0	Yes
	ME11	Not prepared for water survival	Moderate	Moderate	High	ME11M1	Have appropriate personal protective equipment readily available to the flight crew (PFD, Raft & Overwater Survival Kit).	Very Low	Low	Very Low	Moderate	High	Better	$20,000	Equipment purchased for Beavers, additional cost for maintenance, testing & replacement
						ME11M2	Agency develop a process to ensure adequate emergency underwater egress training for flight crews & any personnel on board.	Very Low	Low	Very Low	Moderate	Very High	Best	$15,000	Need to impliment policy
	ME12	Encountering in-flight foreign object debris (FOD).	Moderate	Moderate	High	ME12M1	Follow normal and emergency aircraft checklist and over-incident procedures.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						ME12M2	See and avoid foreign object debris (FOD).	Low	Moderate	Moderate	Low	High	Best	$0	Yes

Table 6 - Training System

Training System																
			Pre-mitigation					Post-mitigation			Benefit~Cost				
Sub-System	ID	Hazards	Prob	Severity	Rating	ID	Mitigation	Prob	Severity	Rating	Cost	Benefit	Rating	Cost	Accomplished
Fire Mission Training	TR1	Returning flight crews lack currency or proficiency in the fire environment during the season startup.	Moderate	Moderate	High	TR1M1	Ensure initial and recurrent training for water scooping has been accomplished by the contractor/agency prior to start of the flight operations.	Low	Moderate	Moderate	Low	Very High	Best	$0	Yes
						TR1M2	For contract and agency personnel, develop and implement fire simulation training in the flight environment including water scooper and fire operations tactics.	Low	Moderate	Moderate	Moderate	Very High	Best	$20,000	Contractors are attending NAFA, Agency pilots are not
Transition to Water Scoopers	TR2	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.	Moderate	Moderate	High	TR2M1	Conduct a flight profile evaluation for each aircraft make and model to identify flight characteristics,performance and tactical applications.	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						TR2M2	Develop specific roles for Aerial Supervision Module/Lead Plane and Aerial Tactical Group Supervisor operational considerations as necessary (add into Aerial Supervision Guide & Scooper Ops Plan).	Low	Moderate	Moderate	Low	High	Best	$5,000	No
						TR2M3	Review and revise existing manuals, handbooks, guides and job aids.	Low	Moderate	Moderate	Low	High	Best	$10,000	Ongoing
						TR2M4	Implement Change Management Plan for the water scooper evaluation project. (Same as AP4M4.)	Low	Moderate	Moderate	Low	High	Best	$0	Ongoing
						TR2M5	Develop and disseminate a briefing paper on the tactics, capabilities, limitations and personnel required for the operation of this mission (Scooper Ops Plan).	Low	Moderate	Moderate	Low	High	Best	$0	Yes
						TR2M6	Include briefing on hazards and mitigations to fireline personnel on incidents (Scooper Manager to perform).	Very low	Moderate	Moderate	Low	High	Best	$0	Yes

Appendix B – Scooper Water Body Coordination Worksheet

SCOOPER WATER BODY COORDINATION WORKSHEET

NAME:					
Latitude:*		*Longitude*:*		*Elevation:*	

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

Operational Control:	
Owner:	
Name:	
Phone:	
Email:	

CONTACT NEEDED PRIOR TO SCOOPING?

YES ☐

NO ☐

Law Enforcement Jurisdiction:	
Name:	
Phone:	
Location:	
Email:	

PERMISSION NEEDED PRIOR TO SCOOPING?

YES ☐

NO ☐

Administration Information:	
Forest/Bureau/State:	
Location:	
Email:	
Phone:	

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

Known Invasive Species:

Environmental Mitigations Needed Pre/Post Scooping:

Comments:

Appendix C – Water Body Selection Process

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

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

Local units are responsible for completing a “Scooper Water Body Coordination Worksheet” (appendix B) for each body of water that may be used for water-scooping operations.

The Process

Upon receiving a dispatch to a wildfire, the dispatcher will determine the closest two bodies of water to the incident. The primary body of water contacts will be notified if required; if the AWSA has been dispatched to a wildfire, request confirmation of permission for use of the body of water.

The final decision regarding safe utilization of a body of water will rest with the Water Scooper Pilot-in-command. The authorities for the body of water used will be notified when scooping operations cease.

Standard Nomenclature for Body of Water Notification

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

- This is (first and last name) from the U.S. Forest Service Dispatch Office.
- Water Scooper Aircraft Identifier (number goes here) has been dispatched to a fire near (geographic location).
- We would like to begin scooping operations at (name of water body goes here) in approximately (number goes here) minutes.
- Scooper (number goes here) will be returning to fill at the water body every (number goes here) minutes.

Once the water body authority has given approval for scooping, the final decision regarding utilization will rest with the Water Scooper Pilot-in-command. Before beginning operations, the water scooper aircraft may make a low pass over the lake to identify hazards.

Follow-up After Action Review (AAR) by the AWSA Manager and dispatch regarding scooping operations will be accomplished with each body of water authority.

Appendix D – Environmental Considerations

Why? 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 assure that firefighting equipment remains operational.

Forest Service fire managers developed these guidelines to help avoid the spread of aquatic invasive species. These are the *operational* guidelines; see Technical Guidelines for more information and references.

All documents are available on the Region 4 Aquatic Invasive Species website: http://www.fs.usda.gov/detail/r4/landmanagement/resourcemanagement/?cid=fsbdev3_016101

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: http://www.fs.usda.gov/detail/r4/landmanagement/resourcemanagement/?cid=fsbdev3_016100 . You can never be certain that invasives are NOT present, but at least you will know ahead of time where they ARE known to be present.
- Avoid drafting from water bodies with known infestations of aquatic invasive species.
- Avoid entering water bodies or contacting mud and aquatic plants.
- 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 sucking organic and bottom material into water intakes when drafting from streams or ponds. Use screens. If pumpkins can be filled with municipal water, draft from pumpkins instead of streams or ponds.
- Avoid obtaining water from multiple sources during a single operational period unless drafting/dipping equipment is sanitized between sources (see “Sanitizing Equipment,” below).
- If contamination of gear with raw water or mud and plants is unavoidable, see “Sanitizing Equipment,” below.

Sanitizing Equipment

Sanitize any equipment that comes into contact with raw water, which means destroying any unwanted organisms. Surfaces to be sanitized include tanks, portable pumps, hoses, and helicopter buckets. If equipment is obtained from a source where sanitizing history is unknown, cleaning and sanitizing equipment will be necessary before use as well as after.

- Establish sanitation areas where there is no potential for runoff into waterways, storm drains, or sensitive habitats. For convenience, set up sanitation stations for aquatic invasives next to weed wash stations.
- 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 equipment was treated prior to arrival on the incident.
  - During an Incident**:** If moving upstream, or from one live drafting/dipping watershed to another.
  - Demobilization (especially larger Type 1 or 2 incidents**):** After use, inspect, clean, and sanitize equipment. Documentation of cleaning can be issued by the helicopter manager to the helicopter pilot stating that buckets 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.

Sanitizing without Chemical Disinfectants (specifically, quat or bleach)

Chemical disinfectants, though effective, can be hazardous to use and dispose of. Non-chemical methods are effective in most situations, and are recommended for:

- 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)

Thorough drying alone is an easy and effective sanitizing method, but required drying times vary considerably with the species and may not be practical for a quick turnaround. Drying may be possible after the incident, especially in hot weather.

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

Alternating used (possibly contaminated) helicopter buckets with spare (clean) helicopter buckets can save time and increase efficiency.

Internal tanks of water tenders, engines, scoopers and other aircraft, and other equipment: 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 scooper aircraft (e.g., CL-415) tanks.

Internal tanks that are NOT accessible (e.g., baffles) 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 chemical disinfectants or 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.

Fill tanks, pumps, or hoses with enough clean, preferably hot, water and flush. Tank baffles may make flushing difficult, and while rinsing with water may not eliminate all organisms, it is better than not flushing.

Appendix E – CL-415 Aircraft Parameters and Specifications

Engines	
• Type	Twin Pratt & Whitney Turboprop (PW123AF)
• Horsepower	2,380 HP
Fuel	
• Type	Jet Fuel
• Fuel Tank Capacity	1,529.85 U.S. gallons (5,791.09 liters)
• Fuel Economy	0.99 nautical miles/gallon (0.42 kilometers/liter)
Performance	
• Flight Time	4 hours (including reserve)
• Maximum Payload	6,400 pounds (2,903.04 kilograms)
• Maximum Take-off Weight	43,850 pounds (19,890.36 kilograms)
• Minimum Take-off Distance	2,670 feet (813.32 meters)
• Rate of Climb	Loaded: 1,300 feet/minute Normal: 1,800 feet/minute
• Service Ceiling	14,700 feet (4,480.56 meters)
• Maximum Cruise Speed	223 miles/hour (185 knots/hour)
• Drop Speed	121 to 127 miles/hour (105-110 knots/hour)
• Minimum Landing Distance	2,180 feet (664.46 meters)
Water Tanks	
• Capacity	1,621 U.S. gallons (6,056.66 liters)
• Tanking	2 Tanks/4 Doors
Aircraft Specifications	
• Cabin Height	6.23 feet (1.90 meters)
• Cabin Width	7.87 feet (2.40 meters)
• Cabin Length	30.84 feet (9.40 meters)
• Exterior Length	64.96 feet (19.80 meters)
• Wingspan/Rotor Diameter	93.83 feet (28.60 meters)
• Fuselage Diameter	8.83 feet (2.69 meters)

Appendix F – Aerial Supervision Requirements[1]

Situation	Lead/ATCO/ASM	ATGS
Airtanker not IA rated	Required	
MAFFS	MAFFS Qualified LEAD/ASM	
When requested by Airtanker, ATGS, Lead, ATCO, or ASM	Required	Required
Foreign Government Airtankers	Required if no ATGS	Required if no Lead, ATCO, ASM
Multi-engine Airtankers Retardant drops conducted between 30 minutes prior to and 30 minutes after sunrise, or 30 minutes prior to sunset to 30 minutes after sunset	Required if no ATGS	Required if no Lead, ATCO, ASM
Single Engine Airtanker (SEAT) SEATS are required to be "On the Ground" by ½ hour after sunset	See Level 2 SEAT requirements	See Level 2 SEAT Requirements
Level 2 SEAT requirements: Level 2 rated SEAT operating over an incident with more than one other tactical aircraft on scene	Required if no ATGS	Required if no Lead, ATCO, ASM
Retardant drops in congested area	Order	May use if no Lead, ATCO, ASM
4 or more Airtankers assigned	Order	Order
2 or more helicopters with 2 or more Airtankers over and incident	Order	Order
Periods of marginal weather, poor visibility, or turbulence	Order	Order
2 or more Airtankers over an incident	Order	Order if no Lead, ATCO, ASM
Smokejumper or paracargo aircraft with 2 or more Airtankers over an incident	Order if no ATGS	Order if no Lead, ATCO, ASM
Incident has 2 or more branches		Order

[1] From: *Incident Aerial Supervision Requirements* (page 32 of *Interagency Aerial Supervision Guide*).