Water Scooping Aircraft

Fire Manager's Guide

Created by Matt Woodwick MN DNR

Table of Contents

Purpose:

This guide is intended to familiarize Fire Manager's, Dispatchers, and Fire Fighters with "Water Scooper" logistical needs, limitations, and operational tactics. This document should be merely used as a guide; the "Water Scoopers" should easily incorporate into any aviation plan with a couple minor considerations which will be defined in this document. When positioned properly and utilized effectively, the "Water Scooper" is a very efficient / cost effective tool.

Understanding of the Water Scooper:

- Water Scoopers are most effective when they are ordered early and work in pairs.
- The Water Scooper can be dispatched to any location with an adequate water source for durations of up to four hours and return to an airport for fuel then return or stand by.
- While the Water Scooper is an airplane, in tactical operations it should be considered more like a type 1 helicopter in that it does not need to return to an airport to reload, resulting in rapid load and return times if an adequate water source is nearby.
- CL-215's may need to return to where their "engine stands" are at the end of each day to perform maintenance. In some cases it is possible to have them overnight away from the maintenance stand. They would need to return to them by the end of the second shift.

Considerations:

1. **Scoop-able Water:**

   Water sources, when limited, should be pre- identified and verify they meet the Water Scooper requirements. They should be **ONE MILE IN LENGTH AND AT LEAST SIX FEET DEEP.** Long narrow lakes or lakes surrounded by steep terrain may become unusable with wind shifts.

2. **Logistics:**

   The Water Scoopers are self sufficient. However, some assistance from the local unit is appreciated. Two areas that the host unit can assist, is ensuring the airport has space to park the aircraft, support vehicles and lodging facilities. Rental cars will also be needed. The crews will acquire them on their own; they may need some help in tracking down a rental company.
   Airport requirements are covered in depth in Airport requirements on page 3.

3. **Water Scooper Types:**

   Currently there are four different sources for Water Scoopers.

   1. Fire Boss (Amphibious SEAT) DOI's On Call SEAT Contract.
   2. CL-215 on DOI Contract (Exclusive Use).
   3. CL-215 on DOI's Call When Needed Contract.

4. CL-215 from the Minnesota Department of Natural Resources (MN DNR). This option can be ordered as a "group" (comes with ATGS with or without ATGS Platform). The "group" option is highly recommended for Units that have not utilized Water Scoopers before. This option **will** come with a Fixed Wing Water Scooper Manager (FWWS) to administer the contract, provide logistical support, and be a liaison between the Local Unit and the MN DNR. Check availability by calling the MIFC Air Desk @ (218)327-4582.

Operational Note:

The vast majority of scoop sites **do not** need to be cleared of boaters or accesses closed. The time on the water is usually 15 to 20 seconds and the pilots generally have ample perspective, time, room and maneuverability options to avoid boaters, on – lookers, anglers etc.

Airport Requirements:

Runway: A minimum 5,000 foot hard surface runway with a taxiway and ramp capable of supporting 36,000 lbs. is required. The Fire Boss requires a minimum of 3,000 feet either hard surface or gravel. It varies with density altitude (i.e. 5500' @ 5,000').

Fuel: The CL-215 requires 100 octane low lead (*100 LL*) while the CL-415 and Fire Boss require *Jet A* fuel.

Access to 100 LL aviation fuel and W120 oil (55 gal. drums). Consider pumping capacity; should be **50 GPM, fuel hose length of 50' for a fuel truck** and **100' for an island**. Volume on hand; demand could reach **1,200 – 1,600 gallon, per day**.

Ramp Space: Two CL-215's or CL-415's and an ATGS platform require approximately a 400' by 400' ramp area. This includes an area for engine stands and support trailers and an 8'x8'x8' covered area for a "Quick Engine Change" (QEC). Running water with hoses should be in close proximity for wash down purposes. If the airport does not have an approved waste containment drainage system, the aircraft should not be washed.

The Fire Boss requires the same space as a Single Engine Air Tanker (SEAT) and may come with a support truck (consult the contract).

Fork Lift: Availability or options for (pick up is also appreciated as support truck cannot always arrive ahead of aircraft).

Electricity or generator: To operate lights and tools.

Crew Quarters: Adequate staging area for pilots and crews to brief and rest out of the elements, restroom, water, ice and access to meals.

Communications: Access to cell phone service, internet, printer and fax machine.

Operational Pre-planning:

Scoop-able Water: When suitable water sources (1 mile long and 6' deep) are limited, some pre-planning can be very advantageous. A GIS person can be very helpful.

Most people when working with Air Tankers create response rings around the base of operation.

When working with Water Scoopers it is important to draw the response rings around the water source to be most effective.

Discuss at length with the pilots specific water sources. A water source may meet the minimum criteria but with current conditions it may not be suitable for the day. It is always the Pilots decision what water source will work for the conditions.

Also discuss with the flight crew any other limitations the aircraft may have due to the local conditions (altitude and weather).

Foam: A supply of foam (up to 165 gallons per fuel cycle) and the necessary equipment for handling it and pumping or loading the concentrate on the aircraft should be anticipated. Foam can be ordered in 30 gallon and 55 gallon barrels. The MN DNR utilizes *Phos-Check WD881-C* foam concentrate. It is a cold weather foam designed to mix with cooler water temperatures. Foam is supplied by the ordering unit.

Aircraft Capabilities:

Aircraft	Cruise Speed	Drop Speed	Maximum Capacity	Time on Station	Maximum Efficient Working Elevation
CL-215	150 KTAS	100 KTAS	1400 gal	4 hours	8,000' MSL
Fire Boss	150 KTAS	100 KTAS	800 gal	3 hours	8,000' MSL
CL-415	180 KTAS	110 KTAS	1600 gal.	4-5 hours	8,000' MSL

It is recommended not to use Scoopers in temperatures below 40° F, due to icing conditions. In most areas of the country this is not an issue.

Like all aircraft, the Water Scoopers are limited by density altitude. The higher and hotter the conditions the less amount of water can be "scooped" at one time and longer take–off distances. As they burn off fuel they will scoop more water per load.

Aircraft Production:

Water Scoopers can deliver 20,000 to 30,000 gallons of water per hour. Obviously that depends on the aircraft and distance from the water source. Thus, making a pre-plan of water sources a critical element of the Operations Plan. *A good rule of thumb is to calculate distance to water equals one minute per mile and add two minutes for scooping (ie.5 miles to water plus 2 on the scoop = 7 minutes between drops).*

Crew Configurations:

Aircraft	Pilot	Support/ Mechanic	Manager
CL-215	2	2	1 up to 3 A/C
Fire Boss	1	1	1 up to 3 A/C
CL-415	2	2	1 up to 3 A/C

Dispatch Procedures:

Dispatch procedures will be determined by the Host Unit. However, they must be shared with the crew during the initial briefing.

Ground Resources:

It is important to brief the ground crews on the capabilities, hazards, and communications with the Scoopers.

Items to cover: Standard line clearing during the drop, potential for trees to snap off, they could see a load every 3-7 minutes depending on location of water, and Agency Specific for working with aircraft.

The pilots all realize that they would be ineffective without ground crews backing them up.

Tactical Operations: Taken from the Aerial Supervisor's Guide 2011.

Scooping Site Requirements – The water source (or pickup lake) should be a minimum of one mile long, ¼ mile wide, free of obstructions, and at least six feet deep. The scooping path does not have to be straight, as the aircraft are somewhat maneuverable while scooping. Factors such as wind, elevation, and surrounding terrain will have a bearing on water source suitability. Less than a full load can be scooped on slightly smaller lakes. Both aircraft scoop at 80 kts, are on the water for about 15 seconds, and cover a distance of about 2,000 feet.

Foam Use

Concentration – Foam can be injected into the load at a concentration of 0.15% to 0.3% up to 3% in some aircraft models. Useful concentrations typically range from 0.15% to 1.0%. Foam concentrations greater than 0.6% are prone to drift.
IASG 2011 Chapter 9 – Tactical Aircraft Operations - 111 -
Wet Foam – A typical method in using foam is to attack a hot fire with straight water or wet foam (0.15-0.3%)
Dripping Foam – After a fire has been knocked down, follow up with dripping foam (0.3-0.5%).
Dry Foam – Dry (0.6-1.0%) foam may be used instead of dripping foam after initial knockdown with wet foam.

Consistency and Water Temperature – The consistency or aeration of the foam is affected by water temperature. A slightly higher concentration may be needed for cold water and adjustments downward may be necessary for extremely warm water. A product for use specifically in cold water is available.

Evaluating Consistency – Foam consistency is best evaluated by ground personnel. Drops can be evaluated from the air using visibility criteria. Wet foam is visible for about 5 minutes, dripping foam for about 15 minutes, and dry foam is visible for 30+ minutes.

Environmental Limitations

(1) Foam is not recommended within 300' of lakes and streams.
(2) In steep drainages or sensitive areas, check local agency policy on foam use.
(3) When scooping during foam operations, it is possible some residual foam may flush out of the vent/overflow. While very diluted, some foam may be visible on the water for a short time.
(4) Obtain a briefing from the IC or responsible agency on the limitations of foam use prior to using.
(5) Rinsing Tanks: Provide for two rinse loads of water to be dropped on the fire prior to departing the incident.

Tactical Considerations

Tank Configuration – The CL-215 has two compartments totaling 1400gallons, and the CL-415 has four compartments totaling 1600 gallons. Loads can be dropped salvo, in trail, or split into separate drops. A salvo load for both air-tankers is about 280' long and 65' wide. A trail drop is about 400' x 40'.

Drop Height – Drop height ranges from 100'-150', depending on factors such as foam vs. straight water and direction of run (into wind vs. downwind).

Clearance – When dropping near ground crews, personnel must be moved at least 200' to the side. When drops are made 1000 feet or more in advance of crews, no clearance is necessary except to confirm no one is on the line.

e) Flight Patterns and Turnaround Times

Typical Flight Pattern – The typical flight pattern (or circuit) 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. IASG 2011 Chapter 9 – Tactical Aircraft Operations - 112 -

Turnaround Times – When water sources are located next to the fire, a 90-second turnaround time is possible.

(1) **CL-215** – A rule of thumb for turnaround times in flat terrain for the CL-215 in an oval circuit is; turnaround time equals miles from lake to fire plus two minutes scooping (ex. 5 miles to the fire from the lake is a 7 minute turn).

(2) **CL-415** – Typical turnaround times in flat terrain for the CL-415 are: 1 mile – 3 minutes, 3 miles - 4 minutes, 6 miles - 6 minutes, 10 miles - 9 minutes, and 15 miles - 12 minutes.

Alternative Flight Patterns – If fire intensity or other reasons indicate a need for drop into the wind or crosswind, then a U-shaped circuit or a Figure 8 may be necessary. Turnaround time will be slightly longer.

f) Fuel Cycle Duration – Average fuel cycle is about 3.5-4 hours. A quick turn from a close lake can shorten the cycle to 3-3.5 hours due to increased fuel demand.

g) Direct Attack and Initial Attack – Scoopers are best suited for initial attack fires. They are most commonly used for direct attack on the fire's edge with drops made half-in/half-out. Like other air resources, they are most effective when worked closely with ground resources, although drops should not be delayed while waiting for ground resources.

h) Parallel Attack – In the event ground resources are delayed or drops advance faster than the crews, a parallel attack is effective. Drops should be placed parallel to the fire's edge at a distance governed by rate of spread and progression rate of ground resources. The ATGS should consider an increase in foam proportion to dripping (.5%) or dry foam (.6-.8%). If the fire does not reach the drops in 30 to 45 minutes, reinforcement drops should be made. If progress by ground crews is too slow, retardant may be another option, with foam and/or straight water used for knockdown and cooling the line.

i) Indirect Attack – While many scooping aircraft can be loaded with retardant at a tanker base, they are not designed to efficiently and effectively drop retardant. Therefore, their capabilities at indirect attack are limited. Narrow, wind-driven fires can be successfully attacked indirectly using foam drops, taking advantage of light fuels or fuel breaks. CL-215's and CL-415's are effective in supporting indirect tactics when used to reinforce retardant or other control lines, hot spotting, and knockdown of slop-over's and spot fires.

j) Supervision – Water scoopers usually require close supervision due to frequent drops (quick turns) and working closely with ground resources. The aerial supervisor should consider the need for additional supervision in the form of another ATGS, ASM, LEAD, or HLCO as appropriate.

k) Scooper Aircraft Communications – Generally, communications with scooping tankers are not much different than conventional air tankers with respect to target description, clearing the line, and drop evaluations, etc. IASG 2011 Chapter 9 – Tactical Aircraft Operations - 113 -

l) Scooping Operation – During the scooping operation, including approach and departure from the lake, communications with the tanker should cease to allow the crew to concentrate on the pickup. The tanker will call when "up" or off the water, which will signify to the ATGS that it's okay to transmit.

m) Foam Instructions – Instructions should be given after the scooping operation on whether or not to inject foam and at what percent so the load has time to mix.

n) Long Turnarounds – On long turnarounds, request the tanker to give a one-mile final call and give your target description at that time or when the target is in sight.

o) Standard Communications – Confirm the line is clear, make the drop, and after the drop, evaluate the load. Instructions for the next load, including foam concentrations, can be given at this time if possible. Otherwise, wait until the tanker is "up" for the next target description.

p) Scooper Aircraft Separation – Once in the circuit on the fire, CL-215's and CL-415's work 500 feet AGL and lower.

Separation of Scoopers in the Circuit – If two tankers are working the same circuit, which is very common, the aerial supervisor can choose to daisy chain the two tankers or they can be worked in tandem.

(1) **Daisy Chaining** – One tanker is on the lake while the other drops. Generally works best for quick turnaround times.

(2) **Tandem** – One tanker leads the other. Generally works best, is more efficient, and requires less supervision for long turnaround times. Also allows ground resources more time between drops to work the line.

(3) **Four Air-tankers** – If four tankers are in a circuit, they can be sequenced singly in a daisy chain, or they can be worked in two tandem pairs.

Mixing CL-215's & CL-415's – Both can work in the same circuit, however the CL-415's are faster and will overtake the 215's on the circuit. If possible, keep separate.

Integrating with other Aircraft – Scooping Tankers can be successfully integrated with suppression and logistical missions of other aircraft.

Horizontal Separation – The most common separation method is to assign different aircraft types to separate parts of the fire, ex., scoopers on the right flank, and helicopters on the left or conventional tankers on the left.

Sequencing – Sequencing of aircraft can be very efficient and often is necessary but requires close supervision.

(1) Have the scooper extend the circuit if there is a need for another aircraft to work the same area as the scooper for a short time, such as a sling load, personnel drop, or a quick recon.

(2) If another aircraft needs to work the same area as the scooper for a sustained period, either orbit the tanker or reassign.

IASG 2011 Chapter 9 – Tactical Aircraft Operations - 114 -

(3) Sustained bucket operations in the same target area as scoopers is not advised, except for very long scooper turnaround times.

(4) CL-215/415 air-tankers can support conventional air-tankers 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.

If you have any questions regarding “Water Scoopers” feel free to call the Minnesota Interagency Fire Center Air Desk at 218-327-4582.