A publication of the
**National Wildfire
Coordinating Group**

NWCG Standards for Water Scooping Operations

PMS 518 DECEMBER 2024

NWCG Standards for Water Scooping Operations

December 2024
PMS 518

The *NWCG Standards for Water Scooping Operations* establishes the standards for dispatching, utilizing, and coordinating water scooping aircraft on interagency wildland fires. These standards should be used in conjunction with the *NWCG Standards for Aerial Supervision (SAS)*, PMS 505, https://www.nwcg.gov/publications/pms505, and any local, state, or geographic/regional water scooping plans.

Please use the NWCG Publication Review Form, https://www.nwcg.gov/publications/publication-review-form to submit constructive input into the next version of these standards.

The National Wildfire Coordinating Group (NWCG) provides national leadership to enable interoperable wildland fire operations among federal, state, Tribal, territorial, and local partners. NWCG operations standards are interagency by design; they are developed with the intent of universal adoption by the member agencies. However, the decision to adopt and utilize them is made independently by the individual member agencies and communicated through their respective directives systems.

Table of Contents

Introduction

This publication is intended to be used in conjunction with other guides or references such as applicable contracts, local Airtanker Base Operations Plan (ABOP), the *Interagency Standards for Fire and Fire Aviation Operations* (Red Book), https://www.nifc.gov/standards/guides/red-book, *NWCG Standards for Aerial Supervision (SAS)*, PMS 505, https://www.nwcg.gov/publications/pms505, and other state, or local aviation plans or guides. These references together assist in the standardization of common procedures and best practices throughout water scooping operations.

This publication identifies the minimum interagency standards for water scooping aircraft operations.

Water Scooper Capabilities

Multi engine scoopers such as the CL-215T and CL-415 are fixed-wing, turboprop, Amphibious Water Scooping Aircraft (AWSA), and are categorized as a type 3 scooper. The maximum water load of the CL-415 is 1,621 US gallons and 1,412 US gallons for the CL-215T. Cruising speed for both aircraft types is 170-180 nautical miles per hour (knots) with a max speed of 190 knots. Normal fuel cycles of four (4) hours are the standard and can be adjusted as needed for long distance dispatches or scooping operations up to 8,000’ pressure altitude. Ferry flights of up to six (6) hours for repositioning are possible.

Single engine AWSA such as the AT-802F, are fixed-wing, turbo prop aircraft with amphibious floats and are categorized as a type 4 scooper.

Single engine scoopers have a hopper capacity of up to 800 gallons, however typical water loads are 500-750 gallons depending on fuel load. Maximum cruise speed unloaded is 155 knots, and 140 knots loaded. Normal fuel cycles can be three to four (3-4) hours. Single engine scoopers may be equipped with water enhancer mixing systems. Refer to specific agency policy on use.

Amphibious water scoopers are most effective when used in multiples of two or more and are administratively supervised as a pair by an agency aircraft manager. They are an effective early initial attack (IA) tool, using direct attack tactics. They are also useful for large fire support and can be used to support other aerial resources as needed. Aerial supervision may be required depending upon incident complexity, pilot qualification level, and aerial supervision guidelines. Flight crews can work independently and directly with a ground contact. Some aircraft are equipped with two (2) FM radios for simultaneous air-to-air and air-to-ground communications as needed. Some aircraft are also equipped with infrared displays for better target acquisition.

AWSA follow all local and national aquatic invasive species (AIS) guidelines and have decontamination procedures, equipment, and trained personnel to mitigate the concern as different water sources are used.

Dispatch

To increase effectiveness, water scooping aircraft should be dispatched in pairs (or more).

Single engine scoopers are capable of (and prefer) being ground loaded before departure. Multi engine scoopers can be ground loaded if requested. In the absence of ground loading, flight crews will fill at a water source close to the incident.

Water Source Selection

Upon receiving a dispatch, the flight crews will determine the closest suitable water source. Coordination between the aircraft manager, flight crews, and local dispatch will vary dependent upon regional water source access protocol. Water source selection may occur en route depending on the geographic area of operations such as Alaska, Washington, Minnesota, etc. Areas of high recreation or restrictive water access should have prior water source coordination setup, and appropriate notifications will be made by the water scooping aircraft manager.

The water scooping pilot-in-command (PIC) shall coordinate separation with aerial supervision and/or other responding air resources depending on the scenario. The transition through or around the Fire Traffic Area (FTA) to the water source shall be approved or coordinated with standard FTA communication protocol.

Upon reaching the water source, the PIC is responsible for surveying the water and surrounding area for suitability. The PIC will assess winds, water conditions, length, width, depth, terrain, ingress, egress, natural and human-made hazards, recreation use, and AIS status.

Depending upon individual operator's standard operating procedures, the PIC will complete a pre-scoop checklist or flow to determine proper aircraft configuration and water system settings. After scooping, the PIC will climb to an appropriate altitude for transition, considering drop altitude, terrain, and other traffic.

Winds

Water scoopers typically scoop into the wind. Surrounding terrain and vegetation will impact mechanical turbulence and should be considered for the approach, scoop, and climb out. Wind direction, velocity, gusts, and downdrafts are visible from above during the water source survey and while on the water. Wind indicators such as white caps, streaks, and cat's-paws, give excellent cues on the expected conditions.

Water Conditions

Factors impacting water conditions include wind direction, velocity, and length of water source. Fetch is known as the distance the wind travels over the water, and will influence wind-driven chop, creating swells given enough length and velocity. Larger water sources are susceptible to larger wave height and possibly swells depending upon the conditions. Smaller water sources with higher winds will not usually develop swells. Narrow water sources may dictate scooping with a crosswind component. Water sources with glassy or smooth water have a higher drag component than water sources with wind-driven chop and will yield a longer scooping run.

Length

Distance needed for scooping is calculated per aircraft performance charts and is impacted by aircraft weight, water conditions, winds, density altitude, and available engine power. The length of the water source may be estimated by recording the time flown from one shore to another. For example, a 30 second run at 120 knots of ground speed on the Global Position System (GPS) will be approximately one nautical mile. The actual length may be measured using the Foreflight satellite view layer and distance tool. Water sources with higher density altitude will produce a longer scooping run due to reduced lift, propeller efficiency, and possibly lower power settings. Higher aircraft weights require a faster liftoff speed and will also increase takeoff distance.

Width

For narrow water sources, flight crews should consider directional control contingencies that may be impacted by crosswinds, poor technique, or mechanical malfunction. Width may also determine if aircraft will scoop in trail of aircraft or offset (to avoid wake vortices and prop wash).

Depth

There are several ways to determine water depth, but the most effective is to survey the water source and surrounding terrain. Water clarity, wave action, vegetation, sun angle, cloud cover, and time of day are a few factors that can enhance or impact the ability to judge depth.

Additional resources such as water mapping tools, electronic marine charts, and local knowledge can assist with depth and suitability determination. Visual clues such as boat docks, types of boats moored or operating, vegetation, and wildlife activity can also assist with depth determination. The PIC will consider adequate depth in the event the water scooping aircraft needs to reject a takeoff and settle into displacement taxi. Single engine scoopers typically require a minimum of four feet of depth and multi engine scoopers require six feet.

Terrain

Ingress and egress will be dependent upon terrain and obstacles surrounding the water source. Terrain will also impact local wind conditions and may render a water source unusable in certain circumstances.

Hazards

Natural hazards include, but are not limited to, shallow areas, rocks, stumps, debris, birds, and tidal changes for saltwater operations. Examples of human-made hazards include, but are not limited to, towers, power lines, buoys, watercraft, bridges, surrounding structures, and proximity of airports.

Aquatic Invasive Species (AIS)

Water scooping aircraft adhere to specific AIS protocol determined by agency contracts, operator mitigation plans, and local unit determination. The water scooper PIC shall record the water source used and coordinate with the manager and ensure the proper inspection and/or decontamination protocol depending upon regional concerns or specific water source AIS status. The *Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations*, PMS 444, provides more information on preventing AIS transport.

Helicopter and Airport Awareness

When a water source or circuit is near a helibase or airport, flight crews shall monitor assigned frequencies and make position reports, as necessary. Avoid overflying helibases and give consideration for impacts on traffic patterns at airports.

Scooper flight crews should anticipate helicopter routes to and from the incident to the helibase and share any communication protocol to incoming scooper flights or relief aerial supervision.

Helibases and local airports may be outside the FTA or Temporary Flight Restrictions (TFR). Flight crews should recognize that these entities may be outside the span of control of the aerial supervisor. Flight leads should consider delegating helibase or local airport position reports to the second aircraft in the flight to share workload.

Water Scooper Circuits (Routes and Patterns)

The pattern for scooping, route to/from the drop area, and pattern for the drop may be collectively referred to as a circuit. Circuit shape may vary depending on terrain, distance, winds, and desired drop patterns, and aircraft deconfliction. Scooper circuits are generally into the wind at the water source and form an Oval, Figure 8, U shape, Parallel, or Concentric shape as needed.

Oval Circuit: Can be flown with right or left traffic.

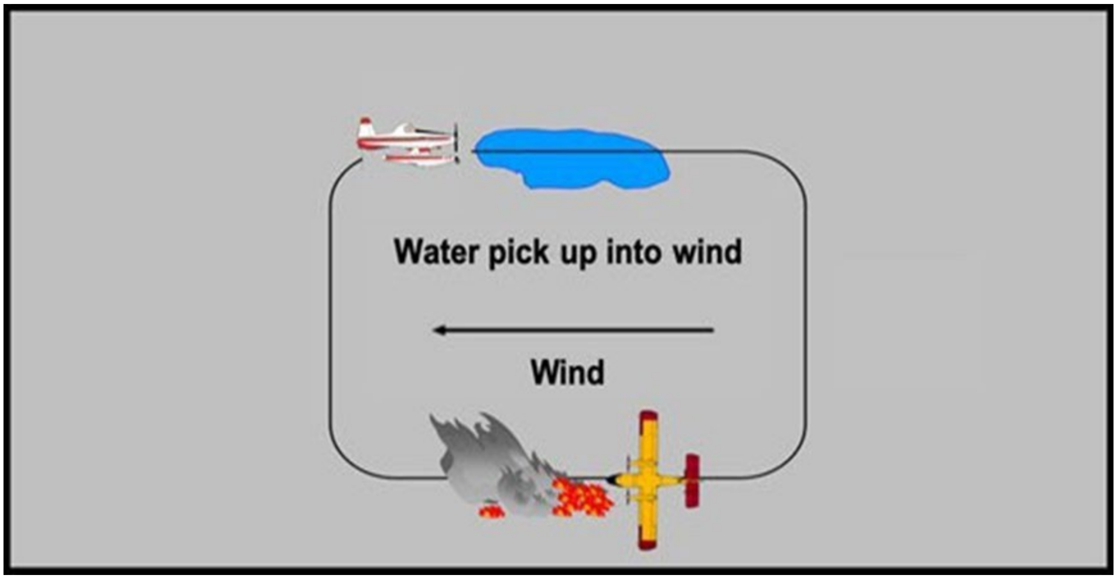
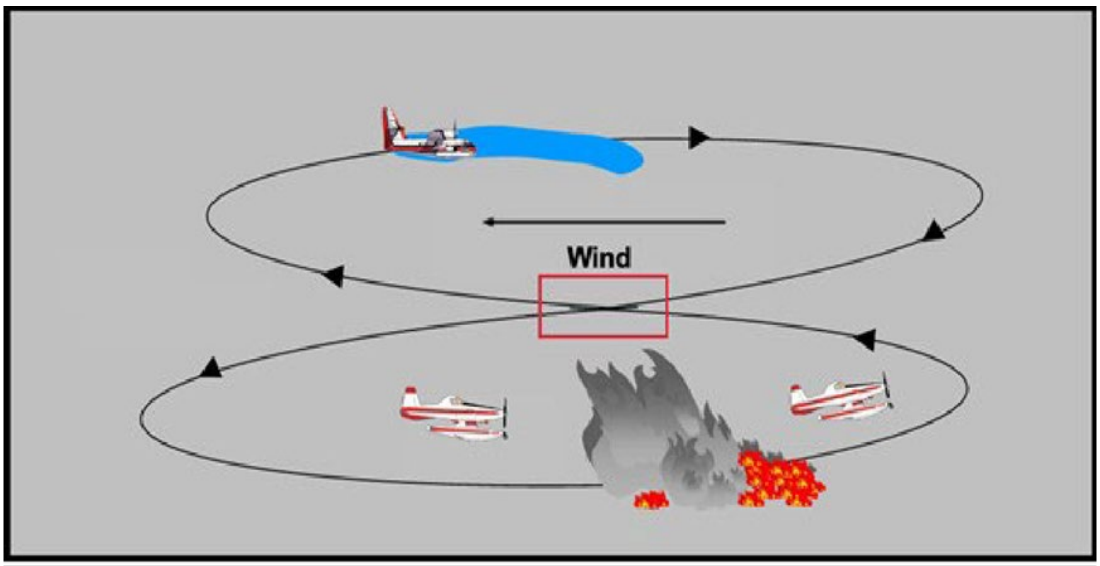
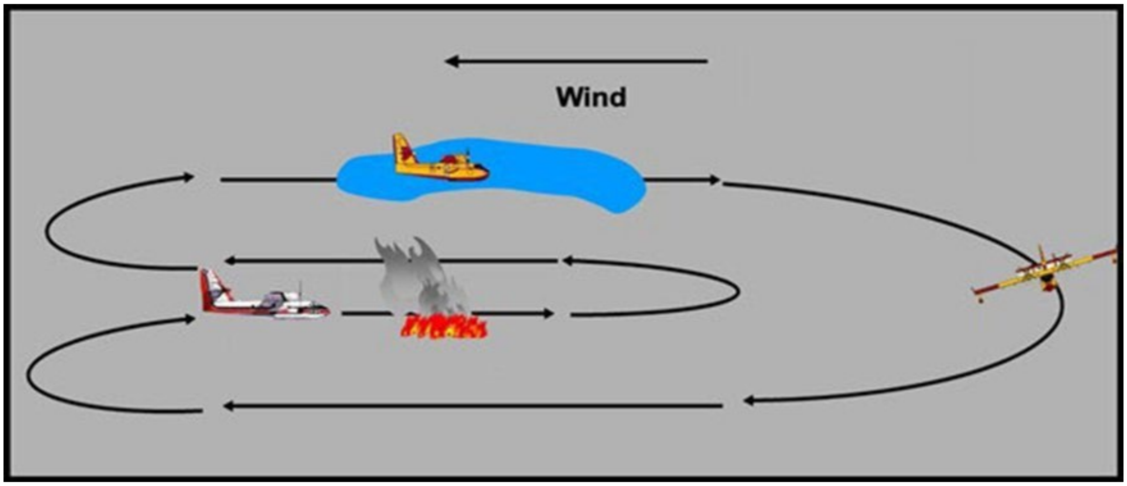


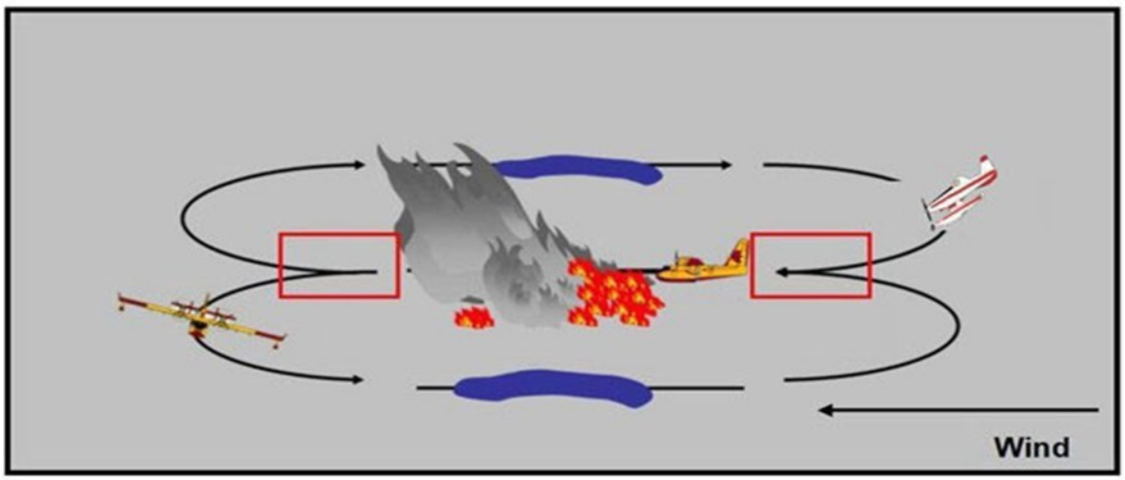
Figure 8 Circuit: Pickup and drop into the wind. Note conflict area and increased maneuvering.



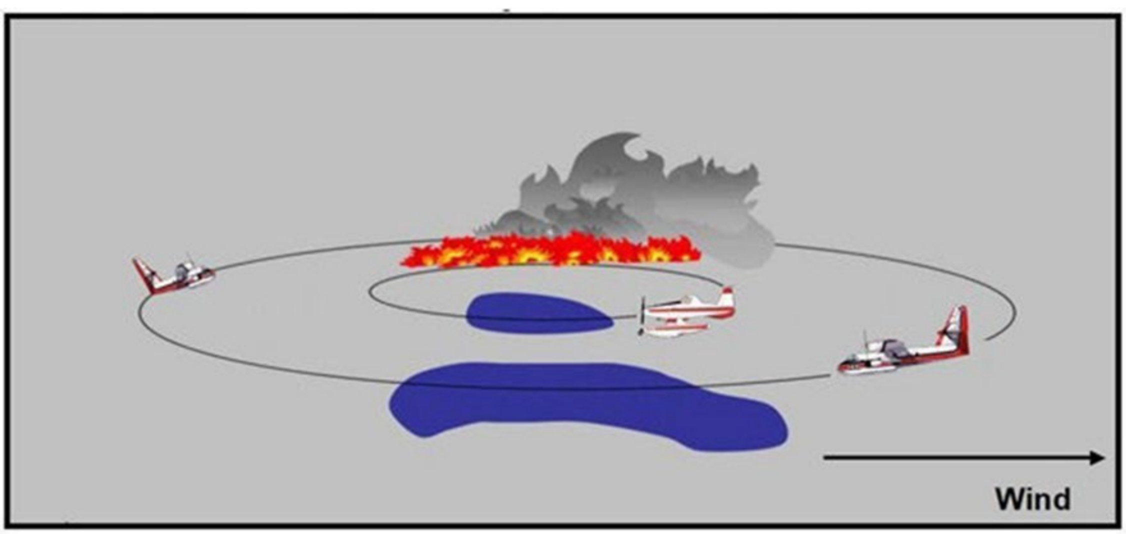
U Shaped Circuit: Pickup and drop into the wind. Note increased maneuvering.



Parallel Circuit: Example of different water sources. Note conflict areas.



Concentric Circuit: Example of different water sources.



Circuit Spacing, Separation, and Sequencing

A safe separation distance should always be maintained within the circuit. This pertains to both air and water operations. In the event spacing decreases, the faster aircraft should adjust (power or geometry) to return the circuit to appropriate spacing. Consideration should be given for maneuvering in the event of a malfunction, rejected scoop, emergency, or loss of directional control. The lead aircraft has the right of way and trail aircraft have responsibility for separation.

The flight lead should consider width of water source, obstacles, watercraft, terrain, wind, and trail aircraft when choosing a scooping lane. If possible, the lead aircraft should attempt to leave clean air for the trail aircraft when crosswind conditions prevail. Subsequently, the trail aircraft should scoop upwind of the lead aircraft to avoid drifting wake vortices and prop wash.

If multiple flights are operating within the circuit, it is each flight lead's responsibility to ensure good separation and communication protocols. All aircraft are expected to operate predictably and advise of any non-standard patterns, orbits, or holding procedures. Flight leads should consider the impact and potential complexity of multiple flights on aerial supervision. Flight leads must coordinate with aerial supervision when simultaneous retardant, helicopter, or smokejumper operations are being conducted in the same target or geographic area. The aerial supervisor will advise if the flights should operate separately within the circuit, or if the flights should operate in daisy chain. When a flight operates behind another flight, each flight lead should still make appropriate radio calls in the circuit and may be advised to drop on different targets than the preceding flight.

Per the *NWCG Standards for Aerial Supervision (SAS)*, PMS 505, single engine scooper flights are limited to four (4) aircraft.

Circuit altitude is the maximum altitude a water scooping aircraft will fly throughout the circuit. The circuit altitude and route should be established and communicated to assist in vertical and horizontal separation. The PIC shall coordinate the circuit altitude with aerial supervision and ensure the route and altitude does not conflict with helicopter or airtanker traffic.

When working in close proximity, it is imperative that scooper and helicopter pilots have positive identification of the quantity and type of aircraft. The flight crews should also be aware of the other resource's dip/scoop locations, routes, patterns, and altitudes. Aerial supervision may increase situational awareness by referencing helicopter type (1, 2, 3), configuration (bucket or tank), and/or model (Skycrane, Chinook, Vertol, S-61, Blackhawk, Huey, 205, A-Star, 407, etc.), as appropriate, when briefing resources. Likewise, water scooping aircraft should be referred to as single engine scooper or multi engine scooper to help positively identify traffic.

Communication and separation protocol will vary depending upon the location of the water source relative to the fire and target area.

<u>Water sources within the FTA</u> — Will yield very fast turn-around times. The flight lead will call "2xx flight off the scoop" and expect clearance to target if active sequencing with other air resources. A checkpoint may be used as necessary depending on circuit shape.

<u>Water sources outside the FTA</u> — Aerial Supervisors and the flight lead will establish a checkpoint if working in close proximity or sequencing with other aircraft. Checkpoints help to establish timing and are best used approximately four (4) miles from target which is generally about two minutes out. The aerial supervisor should ask scoopers to call off the scoop, last aircraft off the drop, and call for clearance at the checkpoint. The flight lead and trail aircraft should make passive (blind) and active radio calls as needed to enhance situational awareness of all aircraft. If not assigned a checkpoint by aerial supervision, the flight lead should suggest one to assist with control measures, situational awareness, and position reporting.

Aircraft Separation

Terrain, visibility, number, and type of aircraft, TFR dimensions, and other factors influence requirements for maintaining safe separation.

Working Area/Area of Operation (WA/AO)

WA/AOs are areas where an identified project or task is being accomplished i.e., (crew support, recon, logistics, retardant delivery, ground firing support, aerial ignition, troop shuttle, jump operation, Unmanned Aircraft Systems (UAS), etc.) with one or more aircraft. Because incidents often have several active WA/AOs with different operating altitudes (based on terrain) aerial supervision resources assign routes, patterns, checkpoints, fences, initial points (IP), holding areas and altitudes to deconflict travel routes between WA/AOs and aircraft bases.

Common Principles of Aircraft Separation

- Use standard aviation 'see and avoid' Visual Flight Rules (VFR).
- Utilize the appropriate air-to-air frequency for position reporting.
- Adhere to FTA procedures.

Aerial Supervisors Ensure Aircraft Separation By:

- Structuring the incident airspace and briefing pilots.
- Monitoring radio communications for:
  - Pilot-to-pilot position reports.
  - Blind call position reports.
  - Tracking aircraft.
  - Giving specific directions to pilots as needed.
  - Advising pilots on the location and heading of other aircraft.

Note: The coordinates of the incident or IP must be verified, updated, and communicated to dispatch to ensure that inbound incident aircraft can determine the appropriate points at which to initiate initial contact and/or hold if communications with controlling aircraft are not established.

Vertical Separation

500 feet is the minimum vertical separation for missions in the same airspace. 1,000 feet is preferred and should be used whenever possible.

- Assign helicopters a hard ceiling (i.e., at or below 4,500 feet). Do not assign them 500 feet Above Ground Level (AGL) or "low-level."
- Vertical stacking of airtankers is not approved. Utilize an orbit altitude racetrack pattern.
- It is common practice to put media helicopters above the Air Tactical Group Supervisor (ATGS) to keep them away from firefighting aircraft.
- Standard operational altitudes and patterns are shown in the table below.

Table 1. Standard Operational Altitudes and Patterns

Mission	Standard AGL (feet)	Standard Pattern
Media	3,500	Right or left
ATGS – Fixed-Wing	2,500	Right
ATGS – Helicopter	500 to 2,500	Left
HLCO – Helicopter	500 to 1,000	Right or left
Airtanker/Water Scooper Orbit	1,500	Left
Airtanker/Water Scooper Maneuvering	150 to 1,000	Left
LPIL	150 to 1,000	Left
Helicopters	0 to 500 (hard ceiling)	Left or right
Smokejumper Ram-Air Chute	3,000	Left
Smokejumper Round Chute	1,500	Left
Paracargo	150 to 1,500	Left
Streamers	1,500	Left

Horizontal Separation

- Aerial supervision must ensure there is adequate visibility to conduct operations safely regardless of the airspace classification.
- Flight patterns must be adequate.
  - Consult pilots before finalizing patterns and routes.
  - Advise pilots on location of other aircraft if visual contact has not been reported.
  - Air-to-air frequency must be clear for pilots to give position reports.
  - Geographic references, such as a ridge or a river, can be used as a virtual fence to separate aircraft provided aircraft maintain assigned flight patterns.

Virtual Fences

Effective for managing airspace with minimal radio traffic on the air-to-air frequency.

Pilots may be required to report arrival at a virtual fence and wait for clearance from ATGS before proceeding. Geographic locations that make effective checkpoints and virtual fences include:

- Roads
- Power lines
- Ridges
- Lakes
- Rivers

Routes

Established point-to-point flightpaths for repetitive missions, i.e., from helibase to helispots, sling sites, dipsite to targets, scoop site to target, etc. For safety, efficiency, and monitoring, the ATGS will ensure flight routes and communications procedures have been established and are known to all participating aircraft and personnel to include helicopter pilots, scooper pilots, helibase personnel, etc.

Defined Routes

Up one stream and down another, up one side of drainage and down the other side, up one side of a spur ridge and down the other, etc.

Daisy Chains

Two or more aircraft or flights can be assigned to the same target and water source for repeated waterdrops. The ATGS, in consultation with helicopter/scooper pilots, will establish a "daisy-chain" flight route for these operations ensuring aircraft maintain the same route, pattern, or orbit direction and separation.

Helicopter Recon Flights

These flights can be difficult to monitor. Aerial supervisors will consider the following procedures to maintain safe separation of aircraft:

- Schedule recon flights during slow periods.
- Assign a specific route for the recon (clockwise, maintain assigned altitude).
- Establish Check Points and clearance protocol with recon aircraft.

Incident Entry and Exit Corridors

Aerial supervision shall determine incident entry/exit corridors as needed. All aircraft must be notified of corridors. If an entry corridor and exit corridor cannot be separated horizontally, then they must be separated vertically.

IPs, Checkpoints, and Holding Areas

The aerial supervisor assigns incoming aircraft to non-conflicting airspaces, or holding areas, as needed. Coordinates or a geographic reference work best.

IP

An initial fixed-wing reporting location clearly identified by the aerial supervisor, which is relayed to dispatch, and communicated to all responding fixed-wing resources. It may be a latitude/longitude or geographic point (landmark). IPs are used to route incoming aircraft to a known location before engaging in tactics.

- Aircraft entering IPs will announce their direction of approach and intended destination via call in the blind script on the assigned primary air-to-air frequency.

Checkpoint

A checkpoint is a reporting location clearly identified by the aerial supervisor. Mandatory reporting checkpoints require a clearance to cross.

Checkpoints are used to:

1. Route aircraft to and from assignments.
   Aircraft using check points while transitioning on an established route will announce their direction and intended destination via call in the blind on the assigned air-to-air frequency.

2. Sequence aircraft:
   a. Checkpoints used for sequencing must:
      i. Be safe from other aircraft.
      ii. Located where pilots being sequenced can see the AO/WA and other aircraft.
      iii. Be close so that the time from the clearance “Cleared to Target” to the aircraft clear of the target is short.
3. Common checkpoints are:
   a. Distances (at 12 miles, edge of the TFR)
   b. Geographic Locations (ridges, rivers, ponds, distinct structure, scoop, dip)
   c. Watch outs:
      i. Time checkpoints are primarily used for ground clearances. (“Division Zulu, Scooper 218 flight is 2 minutes out”). Time checkpoints are too vague for aircraft routing or sequencing.
      ii. Pilots prematurely calling checkpoint prior to arrival.
      iii. Checkpoints like dips or scoops that are outside of the WA/AO require an intermediate checkpoint.

<u>Holding Areas</u>

Any known location can be used by aerial supervisors to hold aircraft. There can be multiple areas on an incident being used at the same time for multiple aircraft at different locations.

- Pilots must be aware of other aircraft in their assigned holding area.
- Pilots must be able to communicate position reports to each other.
- Holding area must be clearly defined – by a geographic reference point or distance and direction relative to the incident aircraft will normally establish a racetrack pattern where they are flying at the same altitude and providing their own visual separation.
- Aircraft must receive clearance to depart the holding area once assigned.
- Helicopters can be held on the ground or in the air as needed to maintain adequate separation. Considerations include:
  - Pilots should be able to maintain forward flight rather than constant hover.
  - Long periods of holding helicopters should be done on the ground.

Sequencing

Sequencing is a technique used to deliver multiple aircraft to a shared target area. Sequencing can be done between fixed and helicopter aircraft to the same target area but should be actively managed by an aerial supervisor. Aerial supervisors should establish an order and provide clearance for each aircraft to the target/drop area.

<u>Sequencing Clearances</u>

- "Cleared to target," "Cleared to target number 2, 3, etc."
  - Denotes an aircraft is cleared to a target/drop area.
- "Cleared to transition."
  - Denotes an aircraft is cleared through the AO/WA (on way to helispot/sling spot, back to helibase, on a recon, scoop site, etc.).
- "Cleared unrestricted."
  - Denotes to an aircraft that active sequencing has stopped and there is no longer a need to call for clearances at the designated checkpoint.

Note: By using this specific language, the situational awareness for all aircraft in the FTA will be improved. The sequencing clearances should not be confused with "cleared in" which denotes the clearance for an aircraft to enter the FTA/TFR.

Caution: Consider wake turbulence when sequencing any type of aircraft. Very Large Airtankers (VLATs) require a minimum 3-minute delay for wake turbulence.

Sequencing Clearance Examples:

- Beaver Air Attack: "Scooper 281 call off the scoop, last scooper off the drop, and call for clearance at Rock Check."
- Scooper 281: "Scooper 281 flight is off the scoop."
- Scooper 281: "Scooper 281 flight is at Rock check."
- Beaver Air Attack: "Scooper 281 flight clear to target, number 2 behind T-101 on left base, caution wake turbulence."
- Scooper 281: "Scooper 281 flight cleared to target number 2, with T-101 in sight."

Intersecting Routes

Intersecting aircraft routes shall be clearly identifiable geographically. Intersections shall have a minimum of 500 feet of vertical separation.

Non-Standard Patterns

Occasionally terrain, visibility, wind direction, or other factors require patterns that are modified or reversed. The mission pilot, airtanker, LPIL, or Helicopter Coordinator (HLCO) shall advise ATGS of situation and request a deviation from standard procedures. The ATGS will advise other aircraft before granting the request and notify appropriate incident aircraft of the deviation and when the non-standard maneuvers are complete.

Cleared to Target and Drop Clearance

A clearance to target is a clearance for the scooper flight to proceed to the target area from the water source, or a checkpoint. A clearance to target, or unrestricted clearance is not necessarily a clearance to drop. The specific communication and separation protocol and ground clearance is determined at mission commencement, and updated with all additions of water scooping aircraft, helicopters, ground forces, and aerial supervision relief. The drop clearance will be determined based on the specific scenario:

- Scooper flight is assigned a ground contact. PIC receives drop clearance directly from the ground contact.
- ATGS confirms line clearance and clears each specific drop. Drop clearance is prompted by scooper checkpoint or pattern position calls "Scooper 2XX downwind/base/final" as appropriate.
- Scooper flight confirms with ATGS that the line is unstaffed and determines geographic drop clearance limits. Subsequent drop clearances are unnecessary as no one is on the ground.

Script Examples:

Passive (Blind) calls: "Scooper 232 flight off the scoop," or "Last scooper is off the drop."

Active calls: "Scooper 232 flight is ridge check."

ATGS: "Scooper 232 flight, cleared to target number two behind a Skycrane on the drop," or "Scooper 232 flight, no other traffic, you are cleared unrestricted."

Flights

Aircraft in flights follow Federal Aviation Administration (FAA) guidance. When operating in support of wildland fires and all risk incidents, aircraft in flights shall follow NWCG FTA standard procedure found in the *NWCG Standards for Aerial Supervision (SAS)*, PMS 505, https://www.nwcg.gov/publications/pms505.

Water scooping aircraft typically operate in flights of two or more aircraft operating in close proximity to one another with a common objective. A flight lead may be determined prior to the dispatch in some operations. Each aircraft PIC should communicate with other aircraft in their respective flights to coordinate routing, altitude, and speeds en route to the water source and target area.

Further direction on flights and FTA can be found in the *NWCG Standards for Aerial Supervision (SAS)*, PMS 505.

During the initial transmission to the FTA, the flight lead will identify themselves with their scooper number, followed by the phrase "flight of" and then the total number of aircraft in the flight (i.e., "Scooper 209 flight of three single engine scoopers, with 211, and 212, twelve miles west at 6500"). Aerial supervision will then communicate FTA clearance to the flight lead. The flight lead should confirm the clearance and each trail aircraft will acknowledge the clearance by transmitting their call sign and respective order in the flight (i.e., "212 #2"). This protocol ensures all aircraft understand the clearance and serves as a radio confirmation for all aircraft in the flight.

Further communications will be given to the flight lead unless specific instructions need to be given to other aircraft. If the same directions are given to each aircraft in the flight, such as "tag and extend from the previous drop," each aircraft in the flight can acknowledge by transmitting their call sign in the flight as appropriate. If directions are unclear to any aircraft in the flight, the pilot should seek clarification prior to the drop.

Any change in flight status shall be communicated to aerial supervision utilizing call signs.

Examples:
Aircraft added to the flight: “Flight of three is now flight of four, Scooper 281 is joining circuit.”
Aircraft returning for fuel: “Flight of three is now a flight of two, Scooper 232 departing for fuel.”

Flight Lead Considerations

Brief mission to flight members. This will be done prior to the mission if aircraft are co-located or can be completed in flight during a join up utilizing a standard briefing:

- Dispatch specifics / dispatch form.
- Water source name / location / specific scooping area / hazards / AIS status.
- Number of flights in the circuit, aircraft in each flight / type / call signs.
- Routes / patterns / altitude (circuit) if known ahead of time.
- Target area specific hazards and considerations.
- Monitor separation for the flight and other resources (consider length and width of flight).
- Manage flight variables (power, speed, geometry) to allow trail aircraft to maintain flight integrity.
- Manage radio communications for the flight with aerial supervision and/or ground contact(s) unless directed otherwise.
- Conduct and communicate pre-scoop checklist for the flight for single pilot operations.
- Conduct and communicate hazard briefings prior to scooping and dropping for any new/additional aircraft that join the flight, or if additional flights join the circuit.

Proactive Communication

Proactive communication ensures that participating aircraft have a shared mental model for the incident response. It is the flight lead’s responsibility to ensure that other resources are aware of their location, altitude, route, and intent.

<u>Comfort Calls</u>

Comfort calls are proactive communications adding concise and pertinent information to enhance situational awareness. These calls help prevent misunderstandings and improve safety by providing confirmed visual contact and separation when multiple aircraft are operating in close proximity.

Examples of Comfort Calls:

- Sequencing:
  - Scenario: Helicopters and Scoopers are working the same target area.
  - Scooper Calls: "Scooper 232 flight Ridge check, with the Chinook in sight," “Second scooper left base with copter in sight,” “Last scooper off the drop with the Skycrane in sight.”
  - Purpose: Position reporting, seeking clearance from ATGS, and lets aerial supervisor and copter know that the scooper has them in sight and will maintain visual separation.
- Altitude Separation and Exit Plan:
  - Scenario: Tankers and Scoopers have the same exit or crossing routes.

- Scooper Call: "Last scooper off the drop, tanker in sight, we will remain below 4000 ft on the exit."
- Purpose: The call informs other aircraft of the Scooper's position and altitude limit relative to the tanker and confirms visual separation.

- Route / Circuit Coordination:
  - Scenario: Scooper circuit is outside of the helicopter routing.
  - Scooper Call: "Scooper 221 flight has the copter in sight and will make our final and exit outside of the copter route and dip."
  - Purpose: Informs the ATGS and helicopter of the scooper's intent, visual separation, and copter route avoidance.

<u>Condensed Radio Calls</u>

Combine information with brevity to cut down on the number of radio transmissions. Consider what information is pertinent and helps maximize situational awareness without wasting words or radio bandwidth.

- Arrival Coordination:
  - Scenario: A flight of 2 scoopers approaches an FTA unloaded with intent to go direct to the water source to join existing flight of 2 scoopers.
  - Scooper Call: "Scooper 263 flight of 2 with 261, 12 miles south, en route to Crane Lake to join with 262 flight."
  - Purpose: FTA entry call gives ATGS information on scooper flight location, number of aircraft, unloaded status, and intended water source and join up.
- Circuit Coordination:
  - Scenario: example 1 – Flight of multi engine scoopers off the scoop behind a flight of single engine scoopers, example 2 – Flight of 2 single engine scoopers at the check behind a flight of 3 single engine scoopers.
  - Scooper 261 Call: "261 flight off the scoop behind 208 flight" (passive call in the blind)
Scooper 218 Call: "218 flight peak check behind 221 flight" (active call to ATGS)
ATGS: "221 flight cleared to target right flank, 218 flight cleared to target left flank at the heal."
  - Purpose: Blind call informing of second scooper flight position and proximity off the scoop, and active call at checkpoint for clearance, and target assignment. Assists the ATGS with multiple flight coordination, timing, and sequencing with other resources. ATGS is able to direct multiple flights, in daisy chain, to different targets while maintaining circuit integrity.

Spacing in Flights

Trailing aircraft must not fly so close as to create a hazard to the aircraft they are following or themselves, whether en route, at the scoop site, and within the FTA. The lead aircraft should adjust power settings, geometry, and patterns to allow trail aircraft to stay with the lead. Coordination between the trail aircraft and lead aircraft assists in facilitating safe and efficient scooping operations. Larger flights will require additional vigilance of the flight lead, and efficient communications within the flight to maintain flight integrity.

A general rule of thumb is one-quarter (¼) mile of separation or approximately 10 to 15 second intervals between drops. Spacing shall not be so close that a rejected scoop or drop of the aircraft ahead would necessitate aggressive maneuvering or increase the possibility of a collision. There must be enough distance between aircraft to allow aerial supervision to convey updated directions considering the preceding drop or a change in objectives. [*See NWCG Standards for Aerial Supervision (SAS)*, PMS 505, Chapter 8.]

Trailing aircraft must be close enough to the aircraft they are following to maintain visual contact. Trail aircraft are responsible for separation and communicating loss of flight integrity. In the event visual contact is lost, it is the PIC's responsibility to communicate position, heading, altitude, and coordinate deconfliction.

Multiple Flights

- Adhere to FTA standard operating procedures concerning radio calls, airspeeds, and sequencing.
- Confirm if flight will join existing flight, operate in daisy chain (one flight behind the other flight), or operate independently from existing flight.
- Choose an appropriate water source; survey hazards, ingress/egress, terrain, etc.
- When joining a circuit, fly over the water source above established pattern (minimum of 500 ft.) to survey and confirm scoop area and communicate join up on scooper frequency.
- Consider other aircraft routes and advise aerial supervision and other aircraft, as necessary.
- Confirm the number of helicopters, and the locations of dip sites, routes, helibases, and helispots.
- Commence operations as directed by the aerial supervisor or Incident Commander (IC) or at the discretion of the initial-attack-qualified PIC if first resource on scene.
- Confirm ground clearance.
- Advise non-standard patterns.
- Make blind calls (such as "Scooper 221 flight off the scoop" and "last scooper off the drop") to maximize situational awareness.
- Call for clearance or report at the checkpoint as directed.
- Incoming flight should attempt to join existing circuit, however, should not hesitate to suggest alternate scooping lanes, water sources, or circuits as conditions change.

Circuit Setup

The initial stages of an incident response require proactive coordination with the ATGS to ensure proper separation and communication protocols are in place for effective, efficient, and safe operations. Flight leads will ensure that the aerial supervisor and the scooper flight have briefed and concur on the circuit plan and the aerial supervisor should inform other aircraft of the circuit plan.

Flight leads may use the Five-Cs concept of circuit setup:

Circuit Checkpoint Clearance Copters Communication

- **Circuit** – Establish the routing and altitude known as the (scooper) circuit altitude.
- **Checkpoints** – Establish a checkpoint if the water source is outside the FTA, or if extended maneuvering is required due to terrain, wind, or altitude climb to the target area. The checkpoint

serves many functions to keep the scooper flight organized: for routing, a clearance / reporting point, an action point for the ATGS to assign a new target and to clear the line, as a contact point for the scooper lead to call the ground if working direct.

- **Clearance** – Two clearances are needed. Through the airspace, and a drop clearance. Determine if calling for clearance at the check (sequencing) or reporting the check (for situational awareness and target assignment). Checkpoint use may change depending on tanker activity, Copter activity, geographic separation of air resources, and sequencing. Do not proceed beyond the hard checkpoint without clearance when it is used for sequencing. Establish the check at the beginning of the mission, even if it appears unnecessary, so that it is available for increased complexity. Determine if ground forces are in the target area or in close proximity. Determine who will receive line clearance. Will the ATGS give you a ground contact, or will they clear each specific drop? What is the clearance limit or safe zone for you to drop, and if the line is unstaffed, is there a plan for ground forces to move into the target area during your fuel cycle? When assigned new targets, ensure line clearance and protocol with the ATGS.
- **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). Ask the ATGS to update copter altitude as needed to ensure separation. Tanked copters often use different dip sites than bucket copters due to surrounding terrain and vegetation at the dip. Be aware of copters on special missions such as HLCO, Recon, Repeater, Rappel, Crew shuttle, Helitack, Sling load, etc. Be aware of drop points, helispots, and helibases. Anticipate their routes to helibase or to their fuel truck when they are departing, or on fuel and return missions.
- **Communication and Separation** – Determine the communication protocol. Are you working on the primary or secondary (rotor) air-to-air. Does the frequency assignment align with the other air resources working in your target area. Monitor the other frequency to remain aware of operations in close proximity, and for changing priorities. Ensure standardized calls off the scoop, at the check, and off the drop and maintain consistent radio protocol throughout the mission.

Be a Team Player in the Circuit

Ensure relief aerial supervision, scoopers, and copters understand the circuit plan. Update the plan as the mission progresses and priorities and target areas change. Be aware that HLCOs and Leads may be task saturated and may not have the same shared mental model of the scooper circuit. Slow down and ensure good separation and communication protocol is maintained and offer suggestions to aerial supervisors as your needs for altitude, routing, and patterns change.

Water Scooper Type Integration

On a short turn-around the multi engine and single engine scoopers operate at similar speeds, therefore spacing can generally be maintained between aircraft in the circuit. Coordination is necessary to ensure there are no conflicts during the scoop or drop and transitions to and from the target area.

On longer turnarounds multi engine scoopers will outpace single engine scoopers. Passing maneuvers must be coordinated and agreed upon on the radio, and the aerial supervisor should be advised. The aircraft/flight that is being overtaken has the right of way. The PIC (or flight lead) of the overtaking aircraft/flight should give way to other aircraft by altering the heading to the right or as coordinated. Passing should not occur in close proximity to the drop or the scoop. It may be prudent to pass after the scoop on the inbound/uphill leg as there is a greater speed differential between single and multiengine scoopers. The flight lead must consider the length of both flights and ensure minimal impact on the flight being overtaken.

Operational complexity, phase of flight, and assurance of appropriate spacing must be considered prior to a coordinated passing maneuver.

On occasion, experience, and comfort levels of each aircraft's PIC may dictate the use of different water sources. This may result in multiple circuits and multiple flights. This is achievable, and at times more efficient and should be briefed with participating flight crews and aerial supervision. See Parallel and Concentric circuit figures on page 5.

Operational Considerations

Constructive Airmanship

During each mission, aerial firefighters encounter different circumstances (peer skill level, comfort level, weather and water conditions, familiarity with other pilots/vendors, etc.). It is imperative for all pilots to work together to achieve a safe and effective mission while working toward common objectives.

Frequency / Radio Management

Water scoopers use a separate frequency to coordinate at the water source and within the flight to minimize impact on the tactical frequency. Utilize a scooper frequency for circuit coordination, inter-flight communications, coordination with other flights, and to keep tactical frequencies less congested.

Pilots should consider the workload and phase of flight of other resources when making radio transmissions. The assigned incident air operations frequency must be monitored at all times. Scoopers should monitor the primary and secondary (rotor) frequencies when working in close proximity to aircraft assigned to an alternate frequency.

Hosting Unit

An agency aircraft manager will be assigned to the water scooping aircraft or group. Plans should be made and communicated to flight crews and agency managers prior to arrival to determine:

Placement of aircraft at airtanker base or nearby fixed-base operation (FBO) or elsewhere.

Integration into daily operations briefings and debriefings at airtanker base or elsewhere.

Fuel: Turbine scoopers require Jet A fuel. Fuel demand could be 750-2000 gallons a day depending on what type and how many aircraft are assigned. The multi engine scoopers (CL-215T/CL-415) will burn approximately 1,500 lbs. or 220 gallons per hour for ferry flights and 1800 lbs. or 265 gallons per hour during water dropping missions. A single engine scooper will hold 380 gallons of fuel and burns approximately 90 gallons or 612 lbs. per hour.

Fuel pumping considerations should be 50 gallons per minute (GPM), fuel hose length of 50 feet for a fuel truck and 100' for an island.

Ramp Space: two CL-215T/CL-415s (94' wingspan 68' long and 29.5' tall) and an ATGS platform require approximately a 300' by 300' ramp area. Vendors usually travel with one support truck and large trailer per pair of aircraft.

The single engine scooper (amphibious AT-802F) requires the same space as a SEAT (60' wingspan 36' long 17' tall) and may come with a support truck and mixing trailer (consult the contract).

A water spigot should be in close proximity to parking for wash down purposes for invasive species mitigation or in the case of having hauled retardant/foam/gel (single engine scooper).

Cooperator Canadian aircraft will travel with support equipment that will require a forklift or scissor lift for offload. Work with host unit and/or airport to identify needs and logistical support.

Hosting units should take into consideration notifications to water users especially during times of high use. Managers and Air Operations Branch Directors (AOBD) may utilize news and social media notifications, and visual aids posted at boat launches. Teams may consider public information officer and/or law enforcement engagement. Coordination with the assigned water scooper manager can assist with notifications as needed.

The *NWCG Standards for Water Scooping Operations* is developed and maintained by the Interagency Water Scooper Subcommittee (IWSS), under the direction of the National Interagency Aviation Committee (NIAC), an entity of the National Wildfire Coordinating Group (NWCG).

Previous editions: 2024, 2023, 2016, 2014.

While they may still contain current or useful information, previous editions are obsolete. The user of this information is responsible for confirming that they have the most up-to-date version. NWCG is the sole source for the publication.

This publication is available electronically at https://www.nwcg.gov/publications/pms518.

Submit comments, questions, and recommendations to the appropriate agency program manager assigned to the IWSS using the NWCG Publication Review Form, https://www.nwcg.gov/publications/publication-review-form. View the complete roster at https://www.nwcg.gov/committee/interagency-water-scooper-subcommittee/roster.