

## **WILDLAND FIREFIGHTING, STANDARD OPERATING PROCEDURES FOR WISCONSIN RESOURCE PILOTS**

### **Introduction**

In 1915 the first use of an aircraft for fire detection on a national level was accomplished in the State of Wisconsin. The Wisconsin DNR has a long history in the use of aircraft for both fire detection and suppression. Over the years the aeronautics section of the Wisconsin DNR and the aircraft used for the purposes of firefighting have undergone many changes.

As the value of forested lands and private property within those forested lands continue to increase, the ability to effectively respond to the threat of wildland fires with aerial resources takes on an even greater importance.

The role of the fire control pilot has become critical as fire fighters strive to aggressively fight fires in a safe and effective manner. The State's use of air tankers and helicopters in suppressing fires mandates that those aircraft be managed in accordance with accepted standards for aerial suppression work.

The objective of this document is to set forth and maintain the integrity of our aeronautics firefighting section by promoting the use of standard operating procedures and terminology by all pilots engaged in firefighting activity within the State.

As our firefighting program evolves, this document will be amended to reflect those changes.

### **Fire Control Pilot Functions**

The primary functions of the fire control pilot are to:

- Detect and report locations and descriptions of smokes and fires
- Provide intelligence to ground fire fighters
- Manage airspace over a fire when multiple aircraft are present
- Direct and supervise aerial suppression aircraft
- Ensure operations are carried out in a safe and efficient manner
- Coordinate the air attack with the ground attack

The fire control pilot's role is multifaceted. The pilot's ability to relay vital information to ground personnel and take on additional duties as a fire grows and becomes more complex is essential. As a fire situation intensifies and more ground and aerial resources are sent to the fire, the pilot must be able to prioritize and manage their responsibilities to ensure the safety of all personnel on the fire.

Since fire control pilots come to the job with little or no knowledge of firefighting it is essential that basic firefighting course work, simulation training and on the job training be accomplished prior to working as a fire control pilot.

The three basic functions that make up fire control flying; detection, intelligence and air attack are progressively more complex and require a higher level of training and qualification. Pilot scheduling for fire duties must take these aspects into account while making every effort to bring pilots to a level of qualification that meets the department's needs.

### **Daily Preparation And Intelligence Gathering**

The fire control pilots should keep apprised of the current fire situation within their assigned area and statewide. The daily routine must address:

- Daily Fire Operations Plan
- Daily Strategy and expectations
- Preparedness

### **Daily Operation Plans**

To help ensure pilot and aircraft availability, pilots need to be given a minimum of one day's advanced notice prior to any fire control air operations.

Each fire dispatch area produces a daily operations plan. When aircraft are being utilized, one or more plans may be sent to the pilot's base each day.

The Operations Plan should arrive at the pilot's base no later than 9:30 am and should include:

- Requested standby times
- Requested flight times
- Location of standby
- Expected shut down time
- Pilot reporting requirements for the next day (if only one plan per day is being sent).

If more than one plan per day is being sent, succeeding Operations Plans should arrive no later than 30 minutes prior to planned shutdown and should include:

- Shutdown or pilot release time
- Pilot reporting requirements for the next day

Pilots should take note of any additional information included on the operations plan, safety messages and air tanker or helicopter availability.

### **Daily Strategy**

Prior to the beginning of each fire day a number of factors have been looked at to determine the overall strategy that fire personnel have in mind for the day. Reading weather reports, noting the fire rating danger and monitoring the activity of other fire routes within the state should all be part of a pilot's daily routine.

Pilots need to be aware of any special circumstances in staffing around the state that may affect them depending on fire activity. The Aeronautics Team Leader should give pilots a "heads up" if they may be needed elsewhere in the state.

During times of heightened statewide fire danger the Aeronautics Team Leader will produce a daily roster indicating pilot and aircraft assignments for fire routes statewide. The roster will be produced and emailed to all pilots and appropriate ground personnel by 10am. The roster should include:

- Name of the fire route by dispatch group
- Pilot assigned to the route
- Aircraft assigned to the route
- Air attack qualifications of the assigned pilots

### Preparedness

Ensure that you and your aircraft are ready for dispatch.

#### A. Route Assignments

Each fire route within the state is unique. It is important that pilots know the following for their assigned route:

- The dispatch group name and frequency.
- Reporting points that make up the route.
- Standard direction of flight for the route. (Clockwise, counterclockwise)
- CO-OP areas where DNR does not have responsibility.
- Special use airspace. (MOAs, Restricted, Class B, C or D)
- Hazards on the route. (i.e. towers over 1,000 feet in height)
- Any specialized procedures for a specific route.
- Airports where fuel can be purchased.

In addition each pilot should contact the dispatcher prior to a flight and confirm:

- Time and route of flight.
- Standby location.
- Communications available at the standby location.
- Requested flight times.
- Special burning rules or permits in affect.

#### A. Special Equipment

Prior to take off ensure the following equipment has been placed in the aircraft:

##### Route Maps

- Local Maps
- Statewide Maps

##### Cameras

- Digital
- Video (if available)

Note: All cameras should be checked for proper date and time stamp settings

##### Contact lists

Fire Size Up and Air Attack form

## B. Aircraft Preflight

30 minutes prior to any standby or flight a pilot should report for duty and ensure the aircraft is ready for dispatch. This includes the following:

- Aircraft preflight completed and fully fueled.
- Aircraft started and run-up in accordance with aircraft checklist.
- AD and inspection times noted and accomplished if necessary.
- Required radios and GPS operational.
- Windows cleaned.

If a mechanical discrepancy is found making the aircraft unavailable, dispatch should be informed immediately. The Aeronautics Team Leader should then be contacted and any arrangements made to correct the discrepancy and cover the assigned route should be coordinated through the Aeronautics Team Leader.

### **Standby and Dispatch**

When on standby, pilots must remain in immediate contact with dispatch via telephone or radio and be prepared for immediate dispatch. Upon dispatch to a smoke or fire the dispatcher will give the pilot the following information:

Smoke or fire location (legal, latitude/longitude or bearing distance)  
The fire tower shot if applicable.  
Ground unit responding  
Any other air resources being ordered

Any information not received on the initial call can be obtained from dispatch while enroute.

It is understood that pilots dispatched to a smoke or fire must operate within the limits of normal airmanship including all FAA rules governing airport traffic. While taxiing out the aircraft altimeter should be set to the field elevation and will become the basis for all altimeter settings in the event that a Fire Traffic Area is put into effect.

### **Detection Flights**

Wisconsin DNR Fire Control personnel rely on three types of fire detection: public reporting, staffed fire towers and aerial detection. The area forester has the responsibility for determining and ordering the detection they feel is needed for any given day. If aerial detection is ordered the fire control pilot is responsible to effectively cover the area assigned. Altitude and actual route flown are important considerations in completing an effective fire detection flight.

### **Altitudes**

Altitude can play an important role in spotting smokes. Under all circumstances it is up to the pilot to select an altitude that is appropriate for the viewing conditions and the size of smoke being looked for.

The standard flight altitude for all detection routes is 1000 feet AGL. Experience has shown that under normal conditions this altitude is high enough for spotting long range (10 to 15 miles) medium smokes and is low enough to spot smaller smokes at close range (under 5 miles.)

High surface winds, lowered visibilities, type of smoke being looked for are examples of things that should be considered by the pilot as they select an appropriate altitude.

### **Routes**

Each dispatch group will have a designated fire route. These routes will be displayed or clearly indicated on existing maps for use in the aircraft. Strict adherence to a route is not required and in many cases not desired. Pilots should modify the routes to meet sun angle and visibility conditions. Since many routes use fire towers as points which determine the route, routes should be modified when fire towers are in use.

### Communications

Clear communication with dispatch is mandatory while any route is being flown. The following guidelines should be followed:

All communications will be on the dispatch frequency  
After takeoff the pilot will call in service:

i.e. *“Park Falls Patrol in service off Hayward”*

When reaching a checkpoint the pilot should report:

- 1) Checkpoint name
- 2) Direction of flight

i.e. *“Patrol is at Danbury, south bound”*

Checkpoint names should be given in clear text (i.e. Shell Lake or Saddle Mound) not checkpoint numbers unless prior arrangement has been made with dispatch.

When the route is completed the pilot will call going out of service:

i.e. *“Brule Patrol out of service at Solon Springs”*

If radio communications are lost the pilot should land at the nearest airport and contact dispatch via telephone.

### Reporting Smokes

All smokes spotted should be reported to dispatch. The following information should be given:

- The size and color of smoke
- Latitude/longitude of the smoke given in decimal minute format
- When giving a legal description in lieu of a Latitude/longitude the pilot should give the information in the following order:
  - Size and color of smoke
  - Township name
  - Legal description in ¼-¼ section
- If a smoke is not an escaped wildland fire the pilot should give a brief description of the scene and whether or not people are present at the scene.

### **On Fire Scene**

After arriving at the scene of an escaped wildland fire the pilot’s primary job is to provide clear, concise and pertinent information to dispatch and to ground resources responding to the fire.

### Communications

Initial size up of the fire should be transmitted to dispatch on the dispatch frequency. The pilot should then establish contact with ground units’ enroute to the fire on the tactical or air to ground frequencies. Once working with ground units on the fire, the dispatch frequency should continue to be scanned if possible.

As the fire grows in size and complexity the pilot needs to be informed of any changes in the fire management structure. The pilot must remain in contact with the person responsible for coordinating the ground attack.

### Fire Scene Size Up

A concise and complete size up of the fire is vital to those ordering resources and responding to the fire. Size ups should include the following information:

- Location (Latitude/longitude, legal, plain text description)
- Fire behavior (i.e. smoldering, surface fire, torching, and crown fire)
- Wind direction
- Fuel Type(s) (i.e. grass, pine, hardwoods, slash etc.)
- Approximate size in acres
- Structures threatened
- Existing fire barriers (i.e. roads, streams, lakeshore)
- Barriers to line construction (i.e. streams, swamps, steep terrain)

Pilots should use the fire size up checklist (Appendix A) to ensure important information has not been missed. The form will also help the pilot make a complete and concise radio transmission.

### Intelligence and Lookout Duties

After initial size up the pilot will remain at the fire scene to provide intelligence for ground fire fighters and serve as a lookout for potentially unsafe fire behavior. Things that need to be reported include:

- Directions into a remote fire if needed
- Torching or crown fire
- Spot fires
- Wind shifts
- Fire outside of control lines
- Snags
- Power lines, propane tanks or other hazards
- Sudden changes in fire behavior
- Fuel type changes in front of the fire
- Structures threatened
- Non DNR personnel on the fire scene
- Suspicious vehicles leaving a fire scene

Pilots will remain on the fire scene until released by the I.C.

### Fire Scene Terminology

Clear and concise communication is dependent upon the use of terms which have common meanings to everyone involved. The following terms with their associated meanings should be used while working on a fire.

#### **Equipment**

4 x 4	A ranger truck operated by a non-ranger.
Brush Rig	A small fire department 4 x 4 vehicle designed to fight brush or grass fires.
Dozer	Any bull dozer used in a firefighting operation.
Fire Department Vehicle	Any non-DNR firefighting vehicles at the scene.
Heavy Unit	A large DNR water hauling truck used to pull a trailer with the tractor plow.

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Tractor Plow      A DNR Dozer with a plow.

### **Fire Activity**

Backing      Describes a portion of the fire backing into the wind.

Creeping      Describes a slowly expanding non-wind driven fire.

Crowning      Describes fire moving from the crown of one tree directly to the crown of another tree.

Holding      Describes any fire break that fire has not crossed.

Involved      Describes a structure which is burning.

Running      Describes a fire with an advancing wind driven head.

Torching      Describes Individual trees (generally pine) with the entire tree on fire.

### **Locations**

Divisions      Portions of the fire designated by geographical boundaries.

Head      The leading edge of a wind or topography driven fire.

Heel      The area at the rear of the fire near the origin.

Left Flank      The left side of a fire looking from the origin.

Origin      The starting point of the fire.

Right Flank      The right side of a fire looking from the origin.

### **Fuel Descriptions**

Brush Pile      A man-made pile of branches, leaves or other natural material.

Crown Fire      Sustained fire in the tops of a group of trees (generally pine) with the fire passing from one tree crown to another.

Debris Pile      A man-made pile of construction or other man-made materials.

Full Pine      Describes a forested area with more than 2/3<sup>rd</sup> pine.

Grass      Describes a non-forested area of dried grass.

Hardwoods      Describes a forested area with less than 5% pine.

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Mixed Pine	Describes a mixed forested area with less than 2/3 <sup>rd</sup>
Pine Plantation	Describes pine trees planted in rows.
Swamp Grass	Describes a lowland grassy area.

### **Values at Risk**

Christmas Tree Plantation	An area of trimmed Christmas trees.
Pine Plantation	An area of pine trees planted in rows.
Structure	Any man made, roofed structure.

### **Fire Line Terms**

Backfire	A fire intentionally set to remove burnable fuel from an advancing fire.
Dozer Line	A mineral soil fire break created by a Bull Dozer.
Power Line	Any seeable alternating current power line.
Retardant Line	A fire break consisting of red colored fire retardant dropped from an aircraft.
Slop Over	Fire that has crossed a dozer line.
Snag	A dead tree inside the fire line.
Spot Fire	A separate smaller fire created by the main fire.
Wet Line	A temporary fire break created by wetting the vegetation.

### **Descriptions**

Attended	Describes a fire with persons visibly tending the fire.
Threatened	Describes any structure or value that is imminently threatened by the fire under current conditions.

### **Transition To Air Attack Pilot (AAP)**

If air suppression resources are ordered the pilot on scene will transition to the role of air attack pilot. It is important that the pilot and ground resources understand the pilot's change in role. As air attack pilot the pilot takes on new duties which may limit their ability to provide intelligence or serve as a lookout for ground fire fighters. It is the pilot's responsibility to prioritize their duties. Duties should be prioritized as follows:

1. Manage Fire Traffic Area airspace
2. Communicate and carry out the air attack plan
3. Assess effectiveness of air suppression activities
4. Monitor ground resources locations and needs
5. Photograph the fire scene
6. Provided intelligence for ground fire fighters or situation unit

Air attack pilots will carry out as many duties as time allows, however, it is clear that their top priority is to accomplish the air attack plan safely and effectively. The accomplishment of other duties may require a second resource pilot on scene.

### **Ordering Additional Air Resources**

Additional air resources will be ordered by the I.C. and run through normal dispatch channels. Additional air resources include: suppression aircraft, DNR intelligence aircraft and Air Attack Pilot relief if required. Dispatch will supply the ordered resource with the following information:

- Latitude/longitude of the fire
- Bearing and distance to the fire
- Air resources enroute to or on scene of the fire
- Air to air frequency in use

The AAP should be advised of any additional air resources dispatched to the fire.

### **Attack Plan**

Once air suppression has been ordered an air attack plan should be formed. Based on the set objectives and the current fire situation the Air Attack Pilot and I.C. should develop an air attack plan. The process should proceed as follows:

- Draw a sketch map of the fire for orientation
- Discuss tactics with the I.C.
- Decide where to start dropping and preferred bombing run direction
- Make inspection runs of the drop area

This should be accomplished prior to a tanker or helicopter entering the Fire Traffic Area.

### **Inspection Runs**

Once an air attack plan has been established the AAP should complete as many inspection runs that necessity or time allows. Inspection runs should be made at the approximate drop altitude. The AAP should determine the following items:

- Record the target elevation
- Look for hazards (i.e. towers, rising terrain)
- Note smoke conditions in the drop area
- Note any distinguishing features to help orient suppression aircraft
- Determine if desired tanker bombing runs can be made safely

### Tanker/Helicopter Communications

The Air Attack Pilot must be ready with instructions for the suppression aircraft entering the Fire Traffic Area. While the Air Attack Pilot has a number of target identification options, it is IMPERATIVE THAT ALL RADIO COMMUNICATIONS BE SHORT, CONCISE AND TO THE POINT; USING STANDARD TERMINOLOGY TO AVOID CONFUSION AND MISUNDERSTANDING.

#### A. Initial Instructions

Example: An inbound tanker calls *“Tanker 423 is five miles out”*

- Direct the tanker to the fire with instructions to orbit.

*“Tanker 423 proceed direct to the fire for left hand orbit call established”*

- Once the tanker is in orbit give a short description of the objectives (i.e. “hit the head” or “cool the right flank”)

*“we want to cool the right flank”*

- Give the target elevation

*“Target elevation is 1200”*

- Give bomb run description – Give direction of the bomb run and its lateral location. Referencing wind (smoke) direction is preferred.

*“Set up for a downwind run...”*

Or reference a compass heading

*“bomb run will be east to west...”*

Note that compass headings can be confusing.

The lateral location of a bomb run is often easily identified by using right or left side. In this situation right and left are always in reference to the bomb run direction.

*“Position for a downwind run on the right side”*

- Describe the target – Pinpoint the exact location of the target along the bomb run.

*“Target is the first black smoke”*

(Use head or flanks to describe the areas of the fire)

*“Target is the head of the fire” or “the first black smoke on the right flank”*

- Only give drop type if not a “salvo”
- Only give drop height if other than “normal”.
- Describe any hazards encountered during the inspection run

*“Caution tall snags off the left wing”*

- Only give exit instructions if required.

On a straight forward fire this would be the target description needed unless the tanker pilot required clarification. The objectives and target are described in one clear, concise statement as follows:

*“Roger 423 in orbit, we want to cool the right flank, target elevation is 1200 feet, make a downwind run, on the right side, target is the first black smoke, caution tall snags off your left wing in the target area, call established on final”*

As the tanker sets up for the drop confirm with ground personnel that the drop area is clear.

B. “On Final”

The tanker pilot will call “On Final” when established on their run to the target. By observing the tanker’s progress through the circuit, the Air Attack Pilot can ascertain whether the tanker is lining up for the target and can pass on corrections as required.

Note: Although the Verbal Description is most commonly used for making the drop, occasionally it may be advantageous to use one of the alternative methods described in “Alternate methods of target identification”

C. Drop Assessment

- The Air Attack Pilot must be in position to observe the tanker’s drop height, line and drop pattern to be able to recognize door or target description problems etc.
- The Air Attack Pilot must also be able to assess drop effect after the load has come to a complete stop. Be aware that under windy conditions foam drops can drift for considerable time and distance.
- Transmit the drop assessment to the tanker pilot immediately after the drop using standard terminology. Tanker pilots are concerned about their accuracy and will want an accurate drop assessment.

**Drop Assessment Terminology**

DROP PLACEMENT

- BULL’S-EYE – the effective portion of the drop’s ground pattern covers the intended target.
- LATERAL PLACEMENT – reference WING SPANS left or right in increments of one-half to a maximum of two.
- LONGITUDINAL PLACEMENT – reference salvo loads long or short in increments of one-half to a maximum of two.

(Drops falling in excess of the above maximums will require a new verbal target description or use of an alternative method of target identification.)

DROP HEIGHT – assess and pass on to the tanker pilot if it is unsatisfactory

- LOW – the drop cloud causes excessive movement and/or breakage in the canopy.
- HIGH – the drop cloud exhibits excessive wind drift or does not apply sufficient foam/retardant or water depth to have the desired effect on the target.

DROP EFFECT – assess each drop to ensure it is having the desired effect on the exhibited fire behavior.

FOAM QUALITY – is the amount of foam being used having the desired effects on the fires behavior?

D. Subsequent drops

Immediately after assessing the drop the Air Attack Pilot should ascertain the Incident Commander’s (I.C.) desire for subsequent drops.

One of three standard orders should be given to the tanker pilot as they depart the fire scene.

LOAD AND RETURN – the tanker should return to base, load and immediately return to the fire for a subsequent drop.

LOAD AND HOLD – the tanker should return to base, load and await the order from dispatch to return or shut down.

SHUT DOWN – the tanker should return to base and shutdown.

If the I.C. desires retardant for subsequent loads the request should be part of the standard order. If retardant is not requested the tanker will be loaded with foam.

When applicable, instructions for subsequent drops should be made in reference to the previous drop. This keeps the instructions short and easily understood.

When building a retardant line for indirect attack the term EXTEND THE LINE can be used to instruct the tanker pilot to connect the tail of this drop with the head of the last drop.

#### E. Alternate Methods of Target Identification

The verbal description is the most common method of target identification. Under some conditions the AAP may have difficulty describing the target or the tanker pilot may have trouble understanding or seeing the line. In these circumstances another method will have to be used.

These methods should be included in practice sessions and used in the field to remain proficient. If the tanker has difficulty hitting a particular target, select another method of target identification.

While conducting any of the following target identification methods the AAP will monitor but suspend communication on all frequencies except to communicate with the tanker on Air to Air.

- STEERING IN – is another method of giving the tanker the direction and lateral location of the bomb run and can be used when there is not enough time to position for a lead in.

In this case the AAP maneuvers to the tanker's 5 o'clock position high and "steers" the tanker as follows:

*".....turn final over the road intersection, steer 270 degrees.....steer 10 degrees left, that line looks good, target is the second hot spot."*

- CALLED SHOT – The called shot is used when the tanker knows the bomb run but cannot see the particular target the AAP has described. The best position for the AAP aircraft to call the shot is paralleling the tanker at its 2-3 o'clock position high. Higher altitudes can be used if the AAP does not have time to descend.

The AAP must see both the tanker and the target clearly. The tanker flies the bomb run. When the tanker is 500 feet from the target the AAP calls the shot as follows:

*"....ready...3...2...1...drop."*

- SELECTED TRIGGER POINT – used when a tanker drops long or short of a target and the AAP notices a reference point that the tanker pilot can use as trigger point e.g.

*"Drop as you come over the ridge." Or*

*"Drop as you come abeam the log pile on the left."*

- DUMMY RUN – the dummy run may be useful when nothing else works.

With the tanker in orbit and able to watch the AAP's aircraft, the AAP will make the dummy run and describe the target as they do the run e.g.

*“Turning base, turning final over the pond, on final running parallel with the road, short final, and target is the second hot spot, caution rising terrain off the left wing, target now, right turn on exit.”*

- DRY RUN – occasionally it may be advantageous to have the tanker crew inspect the bomb run and target before making the final run and drop. This technique can be useful on hazardous or complicated bomb runs and contentious targets.

The AAP describes the bomb run and target as the tanker flies it. The AAP must be in position to see the entire run from turning final to the exit. The drop IS NOT made on a dry run.

### Air Space Management

Airspace management is one of the Air Attack Pilots primary duties. Good airspace management helps ensure the safety and efficiency of all air operations. As the number of aircraft over a fire scene increases the airspace management becomes more complex.

The AAP has overall responsibility for air space management. The use of standard procedure and terminology will ensure a safe and effectively managed air space.

- AAP AIRCRAFT POSITION – The AAP must maintain a position that will provide them with a perspective of what is happening on the fire at all times with respect to target selection, tanker position, ground crew position and air traffic control.

Generally (when not doing inspection runs or lead-ins) this will be a left hand circuit, 500 to 1000 feet above the tanker or helicopter. This separation will change as the volume and type of other aircraft within the managed airspace increases and decreases.

- ALTIMETER SETTING – all aircraft within managed airspace will use a common altimeter setting.
- TARGET ALTITUDE – Prior to suppression aircraft entering the Fire Traffic Area the AAP should have determined the target elevation during an inspection run. The target elevation rounded up to the nearest 500 ft. increment becomes the Target Altitude and is the basis for altitude assignments for all aircraft within the Fire Traffic Area.
- VERTICAL SEPARATION – A minimum vertical separation of 500 feet between aircraft is to be used. An aircraft's position within the stack will depend upon the particular aircraft type and mission.

Once an AAP has completed the inspection runs and a target altitude has been determined, the AAP will climb to 1000 ft. above the target altitude. Suppression aircraft will be initially cleared in at 500 ft. above the target altitude. Tanker pilots may request an additional 500 ft. of clearance if necessary.

For example: The AAP does an inspection run and determines a target elevation of 900 ft. The target elevation is rounded up to 1000 ft. and becomes the “target altitude.” The AAP would climb to 2000 ft. and clear suppression aircraft into the area at or below 1500 ft. If the tanker pilot requests more room the AAP would climb to 2500 ft. and clear the suppression aircraft in at 2000 ft. or below.

- HORIZONTAL SEPARATION – aircraft can work safely at the same altitude if they are aware of the positions of all other aircraft at that altitude. Visual contact is essential when horizontal separation is minimal.

Aircraft performing intelligence work at the same altitudes as suppression aircraft must have clearly identifiable ground boundaries separating them from suppression aircraft as the nature of their assignment severely limits their ability to maintain visual contact with other aircraft.

- VHF-AM RADIO FREQUENCY – all aircraft within managed airspace will monitor a common VHF-AM frequency (air to air frequency). Air suppression packages from Minnesota or Ontario consisting of tankers and ATGS/Birdog aircraft may use a secondary VHF-AM frequency for their bombing operations however; the ATGS/Birdog aircraft must monitor and communicate with the AAP on the common air to air frequency.
- AIR ATTACK PILOT WORKLOAD – the number of aircraft that can be safely accommodated in managed airspace will depend upon the size and complexity of the fire and the AAP’s ability to manage the situation. It is the AAP’s responsibility to recognize when their capacity is being reached and to hold some aircraft outside of the Fire Traffic Area.

The following list of aircraft by priority is offered as a guideline only:

- Medevac
- CL-415 and CL-215 Water Bombing Tankers
- Type I, II, III retardant bombing aircraft
- Type I or II bucket helicopters
- Type IV SEAT aircraft
- Type III bucket helicopters
- Low level intelligence aircraft

#### A. Aircraft Entering and Leaving Managed Airspace

Aerial firefighting personnel have developed a standardized initial attack airspace structure referred to as a “Fire Traffic Area” (FTA). The FTA is a cylindrical zone established around the geographical center of an incident. The zone has a 5nm radius and terminates 1000ft above the AAP’s altitude. In addition to the zone a 12nm “Initial Contact” ring and 7nm “NOCOM” ring are also utilized. FTA guidelines will be followed.

In addition to the communications requirements of the FTA a standardized format for communications will also be followed.

Any non-agency aircraft wandering into managed airspace will necessitate the suspension of air operations until the AAP can establish contact with the aircraft and/or the aircraft leaves managed airspace. The AAP should attempt radio contact on all common UNICOM frequencies and if unsuccessful should attempt to establish visual contact and give instructions visually.

#### B. Twelve Mile Initial Contact Ring

At this point initial contact is made and information exchanged between the approaching aircraft and the Air Attack Pilot.

- Approaching aircraft gives the AAP:
  - Call sign
  - Position
  - Altitude
  - Purpose or intentions
- AAP gives approaching aircraft:
  - Altimeter setting
  - Instructions to hold or proceed
  - Assigned altitude for fire traffic area
  - Routing instructions
  - Instructions to call at the 5 mile ring

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Any approaching aircraft that has not established radio contact with the Air Attack Pilot **MUST** remain outside of the seven mile ring.

C. Seven Mile NOCOM Holding Ring

All aircraft must have established radio contact with the AAP prior to penetrating the seven mile ring. Any aircraft not in radio contact with the AAP are required to hold outside of the seven mile ring until radio contact can be established.

D. Five Mile Fire Traffic Area

Any instructions given approaching aircraft by the AAP such as route or altitude assignments; must be complied with prior to penetrating the five mile ring. In addition the following information will be exchanged:

- Entering aircraft gives AAP:
  - Call sign
  - Position
  - Altitude
  - Visual confirmation of the fire and AAP aircraft
- AAP gives entering aircraft:
  - Pattern instructions
  - Visual confirmation
  - Traffic advisory
  - Target and drop descriptions

E. Aircraft Exiting Airspace

- Exiting aircraft gives AAP:
  - Call sign
  - Position in the traffic area
  - Altitude
  - Destination
- AAP gives exiting aircraft instructions for a safe exit:
  - Bearing or direction
  - Exit altitude
  - Traffic advisory
  - Reloading instructions

Instructions to aircraft entering or leaving the Fire Traffic Area must be clear and concise using standard terminology.

*“Roger tanker 423, check you’re 5 miles out at 2000, continue inbound for a left hand orbit at 2000 feet, traffic is two Blackhawk helicopters low level, half way up the right flank and air attack at 2500. We have you visual.”*

**Ground Crew Safety**

Water or retardant bombing in conjunction with ground attack can present a serious hazard to ground personnel. This hazard is minimized with diligent air/ground coordination.

Ground crews should have received training on working safely in the vicinity of air attack operations.

The following rules will apply during a coordinated air/ground attack:

- The Air Attack Pilot and Incident Commander share responsibility for the safety of ground personnel.
- The AAP is responsible for determining the presence of ground personnel prior to commencing the air attack.
- The AAP must be aware of the exact position of ground personnel that are in the immediate vicinity of the drop zone.
- Drop zones vary depending on the size of the drop and whether the drop is being made with an air tanker or a helicopter. Drop zone shapes and sizes are as follows:
  - Type II and III helicopters: 100ft diameter circle with the target in the middle.
  - Type I helicopter: 200ft diameter circle with the target in the middle.
  - Type IV air tanker: 200ft wide by 500ft long box with the target line running through the center and the target 200ft from the bottom of the box.
  - Type I, II, III air tankers: 400ft wide by 1000ft long box with the target line running through the center and the target 400ft from the bottom of the box.
- Air/ground communications must be maintained between the AAP and the ground crews in close proximity to the drop zone. There must be confirmation that the ground crews have cleared the drop zone prior to the drop being made and confirmation from the AAP that the drop is complete prior to personnel re-entering the area.
- No drop will be made with ground crew in the drop zone. However, due to the construction of DNR tractor plow units a Type IV (SEAT) and a Type III or II helicopter drop may be made with a DNR tractor plow in the drop zone.
- If radio communications cannot be established with ground crews the AAP should make a low pass with the aircraft siren “on” to warn of an impending drop. However, the drop cannot be made without visual confirmation by the AAP that the drop area is clear.
- Ground personnel in the vicinity of a drop zone should be made aware of the direction of the tankers bombing run either by verbal description or by demonstration with the AAP aircraft.
- The AAP, tanker pilot and ground personnel all must have a clear understanding of the exact position of the target.
- Air suppression operations are to be discontinued when the safety of ground personnel is jeopardized. Either ground personnel will move out of the target area or air suppression action will terminate.

### **Project Fires**

On fires where an Incident Command Post (ICP) has been established the Air Attack Pilot will periodically communicate with the Situation Unit and update them on the current status of the fire.

### **Prioritization of Duties**

Providing intelligence to the Situation Unit is a critical element in the overall organization and decision making process of fighting a large fire. Having accurate and timely maps of the fire’s progress and understanding the values at risk ahead of the fire is critical for formulating an appropriate plan of attack and ensure the safety of those affected by the fire.

If a pilot transitions to the role of Air Attack Pilot, of necessity, providing intelligence to the situation unit becomes the lowest priority of their many duties. It is highly recommended that a second aircraft for intelligence work be ordered. If a second aircraft is unavailable the use of ground scouts should also be considered.

In cases where the AAP is the sole source of intelligence for a fire the Situation Unit must clearly communicate their need for intelligence to the AAP. If the AAP is unable to meet their request due to workload the decision to suspend air attack operations in order for the AAP to gather intelligence will only be made by the Incident Management Team (IMT).

## ICP Communications

Any pilot performing intelligence has two main forms of communication with the Situation Unit. Map/Photo drops and radio communications.

- MAPS/PHOTOS - Each fire control aircraft will be equipped with several drop packets for making map drops. Maps may be sketched over a period of time allowing the AAP to sketch a map while performing other duties. The Incident Commander will inform the AAP when the decision to set up an ICP has been made. At that point the AAP should begin work on a map. Sketched maps should include:
  - Fire origin location (Latitude/longitude or legal description)
  - Outline of the fire
  - Wind direction
  - Line construction progress
  - Major landmarks with their names (i.e. roads, lakes, streams, towns)
  - Structures in the vicinity
  - Time the map was created

Photos in various formats may also be dropped along with a map. If photos are dropped a brief description of photo orientation should be included with the map.

Map drops should be worked into the flow of the air attack so as to minimize any disruption to the operation.

- RADIO COMMUNICATIONS – Pilots fulfilling the intelligence role will communicate with the Situation Unit on a predetermined VHF-AM or VHF-FM frequency. To aid communication the Situation Unit and pilot should have the same maps. Radio communications should be clear and concise. Latitude/longitude should be used wherever practicable.
- VIDEO DOWNLINK – Some areas have developed UHF video downlink in conjunction with amateur radio groups. Utilization of this video downlink requires that licensed Amateur Radio personnel are on site at the ICP. AAP pilots may transmit video ONLY when no other air suppression aircraft are within the twelve nautical mile communication ring. Ongoing transmission of video from the AAP aircraft will require a second person in the aircraft.

## Handing Off Duties

All air attack operations involving more than one aircraft require that an Air Attack Pilot be on scene. In the event that an AAP needs to be relieved, other than in the case of an emergency, the relief will be preplanned. The relieving Air Attack Pilot should be brought into the Fire Traffic Area above all the aircraft working on the fire. The acting AAP will give a briefing to the incoming AAP which will include:

- Call sign and type of all air assets assigned to the fire and their current assignments
- Location of known ground units
- Radio frequencies in use
- The air attack plan
- Any unusual conditions or hazards that exist

## **Debriefing**

Debriefing of air attack actions will take place as soon as possible after the pilots return to base. The objective of debriefing is to evaluate actions, isolate problems and take corrective action, not find fault. The debriefing should address:

- Readiness
- Dispatch information
- Strategy and tactics
- Target descriptions and drop assessment
- Flight techniques and traffic separation
- Air/ground coordination
- Communication

- Any other items that impacted or could have impacted or improved the situation
- Efforts should be made to include as many people as possible in debriefing.

### **Aircraft Fuel Management**

All AAP aircraft fuel management will be in accordance with FAA minimums for VFR flight. Air Attack Pilots will plan to land at the nearest refueling facility with a minimum of 30 minutes of fuel on board.

During detection and standby status aircraft will be kept at more than half full on the main tanks and full auxiliary tanks. Aircraft landing with less than half full main tanks will be topped off.

### **SafeComs**

In order to maintain the highest level of safety in regards to air operations, clear and timely communication of unsafe situations is mandatory.

At any time during any phase of air operations, any person who witnesses an unsafe or potentially unsafe situation should generate a SafeCom and forward it to the State Aviation Safety Officer. SafeCom forms will be made available to all personnel involved in air operations.

Upon review of any SafeComs received, the State Aviation Safety Officer should make recommendations or take action to remedy unsafe situations and inform all aviation personnel of any changes to policy or any watch out situations.

### **Aircraft Accident/Incident**

For the purposes of this SOP the terms accident and incident will be in reference to equipment and personnel directly involved in aerial suppression or detection activities. The AAP's responsibility is to report all accidents ASAP and provide assistance and direction as required. They should also be prepared to provide a detailed written report.

#### **Accident**

In the event of an aircraft accident the AAP should:

- Terminate all suppression activity by having the aircraft hold or return to base.
- Notify the Incident Commander and Dispatcher, give details of location and your intentions.
- Remain over the accident site and request assistance.
- Determine the exact location and accessibility to the site.
- Remain over the site until released by ground units.
- Resume (when safe) or terminate suppression activities.

#### **Incident**

In the event of an incident involving air suppression and ground personnel the AAP should:

- Temporarily halt all air suppression activity.
- Notify the Incident Commander.
- Continue air suppression when safe.

### **Administration**

All fire control flight activity will be recorded on the flight log. In addition to the standard items (i.e. start time, stop time, budget code, purpose, etc.) pilots will record the number of smokes, fires, stops and arrests using the following criteria:

- Count every smoke inspected.
- Count every reportable fire worked.
- For every reportable fire a smoke should also be counted.
- A stop should be counted for every smoke a ground unit responds to.
- An arrest should be counted for every reportable fire worked.

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- Record the fire number of every reportable fire worked in the remarks section.

The “Fire Size Up” form is not to be considered as administrative in nature. It is designed to help the fire control pilot do their job effectively and efficiently. Use of the form is recommended but not mandatory.

### **Crossing Minnesota or Michigan Border**

As a courtesy, pilots from Minnesota, Michigan and Wisconsin will report smokes spotted near the border in each other’s state. Since both states utilize aerial detection the possibility of aircraft from both states approaching smokes near the border exists. In order to prevent a possible hazardous situation all pilots must receive clearance from their dispatcher prior to crossing the State border.

Dispatch will be responsible to contact the neighboring dispatch and confirm that no other aircraft is enroute to the smoke. Once cleared by dispatch a pilot may cross the border and supply a size up of the situation to dispatch who will forward it to the neighboring state.

### **Minnesota/Ontario Air Suppression Operations**

As a member of the Great Lakes Forest Fire Compact, aerial suppression aircraft from other Compact members may be ordered to assist on larger fires in Wisconsin. To ensure consistent and safe aerial operations the following protocol will be followed.

#### **Arrival Procedures**

- Once airborne and established enroute, Minnesota and Ontario air attacks should relay an updated ETA to their respective flight desks and have the ETA forwarded to those in Wisconsin who ordered the aircraft.
- Minnesota and Ontario air attacks should attempt to establish contact with the Wisconsin air attack pilot as soon as practicable on AM frequency 122.925.
- Unless otherwise requested Wisconsin air attack pilots will use 500 foot increments of vertical separation when giving altitude assignments for the Fire Traffic Area.
- Arriving suppression aircraft can expect to be assigned an altitude which will give them a minimum of 500 feet clearance above the canopy of surrounding terrain rounded up to the next 500 foot MSL altitude.
- Fixed Wing/Helicopter Coordinators will be assigned the next 500 foot MSL altitude above suppression aircraft.

#### **Duties and Responsibilities**

- Wisconsin Air Attack Pilots will retain the position of Air Tactical Group Supervisor.
- Minnesota Air Attacks and Ontario Air Attack Officers will be assigned as Fixed Wing/Helicopter Coordinators and be responsible for the coordination of all suppression aircraft on the fire.
- Wisconsin Air Attack Pilots will be primarily responsible for communication with ground personnel to develop and coordinate air and ground attack plans.
- Wisconsin Air Attack Pilots will communicate ground objectives and targets to the Fixed Wing/Helicopter Coordinator.
- The Fixed Wing/Helicopter Coordinators will be responsible for tactically accomplishing the air attack plan.
- Both Wisconsin and visiting air attacks will be responsible for evaluating the effectiveness of the air attack plan and ensuring safe operations over the fire.

#### **Communications**

- Wisconsin Air Attack Pilots will use the call sign “(fire name or dispatch group) Air Attack”. i.e. “Mallard Air Attack” or “Brule Air Attack”.
- Minnesota air attacks will use the call sign “ATCO (number)”, i.e. “ATCO3”.
- Ontario Air Attack Officers will use the call sign “Bird dog (number). i.e. “Bird dog 4”.
- All air takers will use their assigned tanker number as their call sign. i.e. “Tanker 225”.
- Initial communication between Wisconsin aircraft and responding out of state aircraft will be on AM frequency 122.925.
- Federal “Fire Traffic Area” guidelines will be followed.

**Basic Aerial Firefighting Rules**

- Safety is the primary consideration and will not be compromised.
- Air attack is virtually always a coordinated air/ground effort.
- Air/ground communication must be established and maintained during coordinated air/ground attack.
- Follow standard operating procedures, use common terminology.
- Inspection runs must be done. Don't ask a tanker to fly a run without first determining that the run is safe.
- All bomb runs are to be made downhill or over level terrain. Never ask for an uphill run.
- Make bomb runs down sun, as opposed to into the sun whenever possible.
- Identify all hazards on the run to the tanker pilots.
- Make extensive use of the FM radios, or siren, if radio contact cannot be made, to ensure ground crews are clear of the drop zone and aware of impending air attack.....zero tolerance.
- Practice sound cockpit resource management techniques.
- Do not place foam suppressants in ecologically sensitive areas.
- Normal practice is not to place water drops on foam drops.
- Report any unsafe practices immediately.
- Plan your actions but be prepared to change the plan as the situation dictates.
- Unless otherwise indicated all drops will be salvos.
- When using the terms "right" or "left" in reference to target or bomb run descriptions, the terms will relate to the tanker's direction of flight.
- Manage for maximum effectiveness and efficiency.

**Glossary of Terms**

(AAP) Air Attack Pilot	A person responsible for directing one or more aircraft on a specific fire or division of a fire.
Accident	An Action that causes substantial damage to equipment or serious injury to personnel.
Accuracy	An assessment of the drop by the Air Attack Pilot (AAP).
Air Attack	A fire suppression operation involving the use of aircraft to deliver firefighting suppressants or retardant to or on a fire.
Air tanker	A fixed wing aircraft fitted with tanks and equipment for dropping suppressants or retardants on fires.
Air tanker Base	And operational base at which air tankers are held in readiness for action on fires.
Bomb runs	The path the tanker flies on approach to the target.
Break left/right	A command for an immediate turn left or right.
Called shot	A drop technique where by the AAP triggers the drop by voice signal to the tanker.
Drift	Advice or indication that a wind condition exists of sufficient velocity to significantly affect drop placement and that a correction must be allowed for.
Drop leg	Part of the bombing circuit, the approach and departure from the target.
Drop zone	Target area.

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Dummy run	A simulated bomb run made on a target by the AAP to indicate the target and run to the tanker.
Early	Advice that the drop is to be or was triggered short of the designated point.
Extend	<ol style="list-style-type: none"><li>1) An instruction to tag on and extend the line in a specific direction.</li><li>2) An instruction to extend a circuit, leg or bomb runs beyond a designated point.</li></ol>
Final	A bombing run where the tanker intends to make the drop.
Fire Traffic Area	An five nautical mile radius, 3000 foot high area established around the center of a fire where air suppression operations are in effect.
Foam	A liquid chemical added to water that is to be dropped on the fire which when mixed with air (while falling from the aircraft to the canopy) becomes foam enhancing the fire suppression abilities of the water
Gap	A week or missed area in a retardant or suppressant line.
Head end of drop	The most forward portion of the drop on the ground based on the direction of the bomb run.
Hold	<ol style="list-style-type: none"><li>1) An instruction not to drop and await further advice.</li><li>2) An instruction not to enter managed airspace, a specific area or to remain in a specific area.</li></ol>
Incident	An action that causes minor damage to equipment or minor injury to personnel.
Incident Commander (I.C.)	The person responsible for the running of any incident. The “Head Honcho”, “Big Kahuna”, “Man with the Plan”, etc.
Inspection run	A pass over the target by the AAP or tanker to assess the bomb run,, target area and exit from the target.
Late	Assessment that the drop landed beyond the designated point.
Lead-in	The technique whereby the tanker follows the AAP on the final run.
Load	Term used to describing the drop.
Load width	The width actually covered by a drop on the ground.
Long	Assessment that the dropped landed beyond the designated point.
New target	Indication or advice that a new target for the bomb run has been selected and that the target description will follow.
Orbit and direct	Technique whereby the APP identifies targets by verbal description while orbiting the fire.
Reportable fire	Escaped fire receiving a fire number from dispatch.
Retardant	A substance that by chemical or physical action reduces the flammability of fuels.
Run	The flight path of the tanker to the target.

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Salvo	The technique whereby a specified number of doors are opened simultaneously.
Short	Assessment that the drop landed before the designated point.
Staging area	A location close to a fire where resources are held. Often used when a coordinated air/ground attack cannot be effectively carried out. Staging areas are used to maximize safety and resource efficiency.
Suppressant	An agent used to extinguish the combustion by direct application to burning fuels.
Tail end of drop	The aft end of the drop on the ground based on the direction of the bomb run.
Target elevation	The elevation in feet of the inspection run at which the AAP safely passed over the target at approximate bombing height.
Target now	Voice signal from the AAP on a lead-in or dummy run to indicate the target location.
Trail drop	Technique whereby the flow of retardant or suppressant from the tanker is restricted to give a long unbroken line.
Uphill run	A bomb run that requires the tanker to continue or initiate a climb in order to clear terrain following the drop.
Verbal description	The technique whereby the AAP identifies targets by verbally describing the Bomb run and target position
Water bombing	The act of dropping suppressants on the fire from an aircraft in flight

### **Mandatory Communications**

1. Tanker or helicopter calls once clear of the airport traffic area. This communication to the DNR Pilot lets them know that a suppression aircraft is enroute and that they should transition to the role of Air Attack Pilot (AAP).
2. ETA of tanker or helicopter enroute. This communication lets the AAP know how much time they have to complete inspection runs and develop an air attack plan.
3. Entering and leaving the Fire Traffic Area. Standard operating procedure will be followed by all suppression aircraft entering and leaving the fire traffic area.
4. Orbiting Altitude. Tanker pilot relays their initial orbiting altitude to the AAP. This becomes the standard for successive drops and determines stacking altitudes. Any change in orbiting altitude must also be passed on to the AAP.
5. Helicopter landing and taking off for bucket deployment. This communication helps the AAP track the helicopters progress either in the Fire Control Area or in preparing for bucket operations.
6. Helicopters inbound with initial load. This communication lets the AAP know that the helicopter is ready for drop instructions.
7. Tanker on final. This communication alerts the AAP that the tanker is in the critical phase of making a drop at which time the AAP will be assessing target line and drop accuracy.
8. Safety concerns. Any safety concerns noted by tanker or helicopter pilots should be communicated immediately to the AAP.

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**Airspace Management Responsibility**

The Air Attack Pilot will be primarily responsible for airspace management.