The “Scoop” on Water Bombers

The Use of Water Scooping Airplanes for Combating Forest Fires

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Presentation Outline

• Welcome and introduction
• Types of air attack aircraft
• The role of fire-fighting aircraft
• Aerial Fire-fighting tactics
• How Scoopers work
• History of scoopers
• Present day scoopers
• Scoopers of the future
• The “ultimate” scooper
Welcome and Introduction

- **Jamie Sargent** - Vice President of Sales for Fire Boss LLC – a sister company of Wipaire, Inc.
- Former General Manager of Aviation Services, Aviation & Fire Management Branch, Ontario Ministry of Natural Resources (Ontario Provincial Air Service)
- Responsible for sales and support for the amphibious Air Tractor AT-802 “Fire Boss” water bomber
Types of Air Attack Aircraft

- Land-based air tankers
  - Load retardants at airport tanker bases

- Helitack
  - Load water into buckets or tanks

- Scoopers
  - Scoop water from nearby water sources
Do Water Bombers Put Out Fires?

- Surprisingly ... NO!
- Neither do air tankers or water bombing helicopters
- Ground crews do
- Water bombers are used to “knock down” hot spots, help prevent fires from spreading, and cool down the fire environment so that ground crews can work safely

Source: California Fire Pilots Association
Aerial Fire-fighting Tactics

- Three basic methods:
  - Indirect attack
  - Parallel attack
  - Direct attack

Source: Gary Grass
Indirect Attack

- Tactic used on large fires
- Land-based retardant bombers are best
- Drops are made away from the main fire
- Utilize natural barriers
- Burn out between fire and retardant drop
Parallel Attack

- Drops are made a short distance from fire’s edge
- Takes advantage of light “fuels” and barriers
- Straightens ragged edges
- Burn out between fire & control line
Direct Attack

- Tactic used on small “hot spots” and large fires
- Drops are made directly on fire or on edge of main fire with water or retardant
- Scoopers are better for continuous/high volume attacks when water source is nearby for scooping
How Scoopers Work

- Depart from an airport or lake
- Find a water source close to fire
- Make a normal seaplane approach and landing
- Keep the aircraft on the step while scooping water through fixed or retractable “probes”
- Climb out loaded to fire
- Drop as directed and return for load as soon as possible
A Typical Scooping Run

Total Distance (5280 ft)

Approach (50 ft)  Skimming (2000 ft)  Climb-out (50 ft)

10 seconds
A Typical Scooping System

- Water is scooped into external or internal tanks through retractable or fixed probes
- Probes extend from floats or aircraft hull
- Typical filling time is 10-30 seconds
- Tanks are vented
- Loads can be pre-set or allowed to overflow
Scooper Tank and Door Systems
The Birth of Aerial Fire-Fighting

- The U.S. was the leader for land-based air tankers
- Canada led the way for seaplanes and scoopers
- Early air tanker innovators were either ex-military or agricultural pilots
- The U.S.-Canada air tanker race was almost as exciting as the U.S.-Russian “space race”
Aerial Fire-fighting in the USA

- The first U.S. fire-fighting aircraft was developed by Willows Flying Service (California) in 1955
- Vance Nolta made the first water drop from a Boeing Stearman
- The Stearman 75 “Cadet” was modified with a 170 gallon tank and a hinged fire gate covering a hole in the belly of the aircraft
- In 1956, seven agricultural biplanes were modified to drop a water/chemical mix. This was the first operational aerial fire-fighting fleet in the USA
The Birth of Scooper Systems

- The first seaplane-based fire-fighting systems were conceived by Carl Crossley of the Ontario Provincial Air Service (OPAS) in Temagami, Ontario, Canada in 1944

- Crossley fitted a water tank in a Norseman that could be filled through a pipe while the aircraft taxied on the water. He made 3 successful drops on a fire on August 26, 1945

- Unfortunately, the concept was abandoned until 1950
Early Water “Bombers”

- The OPAS began experimenting with actual water “bombs”
- 5-gallon water bags were dropped through the camera hatch of a Beaver
- The 35 lb. bags were initially dropped one at a time but eventually involved multiple drops of 8 bags from a sloped “beer store” conveyor belt
The “Bag” Idea “Bombed”

- The water bag system was not effective ... the 8-bag system only covered an area of 10’ x 90’
- Often, the bags would spread the fire while posing a serious threat to anyone/anything on the ground
- The first operational water bag mission took place on September 9, 1950 but the idea was “dropped” shortly after
Getting closer ... Flying Boats

- In 1946, the OPAS tried to convert a PBY Canso into a heavy water bomber by fitting it with external water tanks.
- The tanks had to be filled at an airport making the PBY a "land-based bomber".
- The idea was quickly abandoned.
During the early 1950’s, Tom Cook (future OPAS Director) built on Crossley’s idea. Cook and air engineer George Gill mounted two rollover tanks on the top of aircraft floats which could be filled through a fixed snorkel while taxiing on the step.
In 1957, Cook successfully attacked a forest fire with an Otter equipped with two-80 gallon rollover tanks and fixed probes.

Smaller rollover tanks were soon installed on all OPAS piston Beavers.

The system worked well but had some drawbacks.
The Center Tank Concept

- Single belly tanks were eventually developed and installed on OPAS Otters and Beavers
- The system used a single fixed probe attached to the right float
- The center tank reduced drag and improved the water drop pattern
The U.S. Adopted the Concept

- The U.S. Forest Service quickly adopted the rollover and center tank concepts for its fleet of piston Beavers
- Early systems were rollover ... subsequent scooping systems utilized a modified F-86 fuel tank and one pick up tube
- The USFS’ 125 gallon center tank system is still in service today!
The Birth of the Modern Scooper

- Knox Hawkshaw of Field Aviation invented the modern scooper system.
- The system consisted of a retractable scooping probe or probes that filled tanks within the hull of a PBY “Canso” flying boat.
- The 1,000-1,400 gallon water load was dropped through bombing doors that were built into the bottom hull.
- Field converted 18 PBYs for Quebec, Newfoundland, and other Provinces.
- The PBY scooper was introduced in the U.S. in 1963 by Liston Aircraft in Washington State.
- Tanker 85 was retired in 2007.
In 1965, Field Aviation began work with the OPAS (now OMNR) to develop scooper systems that were installed within the EDO and CAP floats on the Turbo Beaver, Otter, and Twin Otter.

The Turbo Beavers and Otters were retired from water bombing service by 1987.

The Twin Otters fleet was equipped with Wipline 13000 series amphibious water bombing floats in 1997.
Other Scooper Concept Aircraft

- Piston Sea Thrush – 1983
- Turbo Sea Thrush – 1987
- Ayers 660 – 2000
- Capacity range of 300 – 600 gallons
- All designed by inventor and pilot Paul Hajduk of Terr-Mar Aviation in Vancouver BC
The “Grand-daddy” of Scoopers

- The JRM-3 Martin Mars
- Built as a WWII Troop Carrier for the Pacific
- Retired for scrap in 1957
- Four aircraft purchased and converted for fire-fighting by Dan McIvor in 1959
- Two remain in service today with Coulson Flying Tankers on Vancouver Island
The Martin Mars - Specifications

- Wing span: 200’
- Length: 120’ 3”
- Height: 47’ 11”
- 4-2,500 shp Wright 3350 radial engines
- 162,000 lbs gross weight
- 7,200 gallon water capacity
- Scoop speed: 60-70 knots
- Drop speed: 110-120 knots
- < 29 second scoop time
• Design started in 1963 based on PBY concept and success
• Production started in 1968
• First purpose-built aerial-fire fighting aircraft
• 125 aircraft built in 20 year production run
• 2-2,100 shp PW radial engines
• 1,400 gallon capacity
• 2-door bombing system
The Super Scooper – CL-415

- Design built on success of the CL-215 and the CL-215T turbine conversion
- Introduced in 1992 as multi-purpose aircraft
- 75+ produced to-date
- 2-2,380 shp PW turbine engines
- Capacity of 1,600 gallons
- 4-door bombing system
International Scoopers

- Beriev Be-200
  - 400 knot jet
  - 3,000 gallon capacity

  - 300 knot turboprop
  - 3,500 gallon capacity

- Chinese SH5 Dragon 600
  - 300 knot turboprop
  - 3,500+ gallon capacity
My Favorite Scooper 😊

- AT802 “Fire Boss”
- Air Tractor AT802 equipped with Wipline amphibious water scooping floats
- 1,600 shp PW PT6A-67F turbine engine
- 800 gallon tank capacity
- Rapid initial attack aircraft
- 51 Fire Boss aircraft in operation to-date
The Ultimate Scooper

- Long-range deployment
- Rapid initial attack and long-term sustained attack
- Piston radial and modern turbine engines
- Burns unleaded and turbine fuel
- 8,800 gallon water capacity
- The ultimate airborne “tsunami”
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- Mitch Miller (OMNR Communications – Fire)
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Questions?