

The “Scoop” on Water Bombers

The Use of Water Scooping Airplanes
for Combating Forest Fires

Northwest Aviation Conference
February 27, 2011

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?



Source: California Fire Pilots Association

- 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

Aerial Fire-fighting Tactics

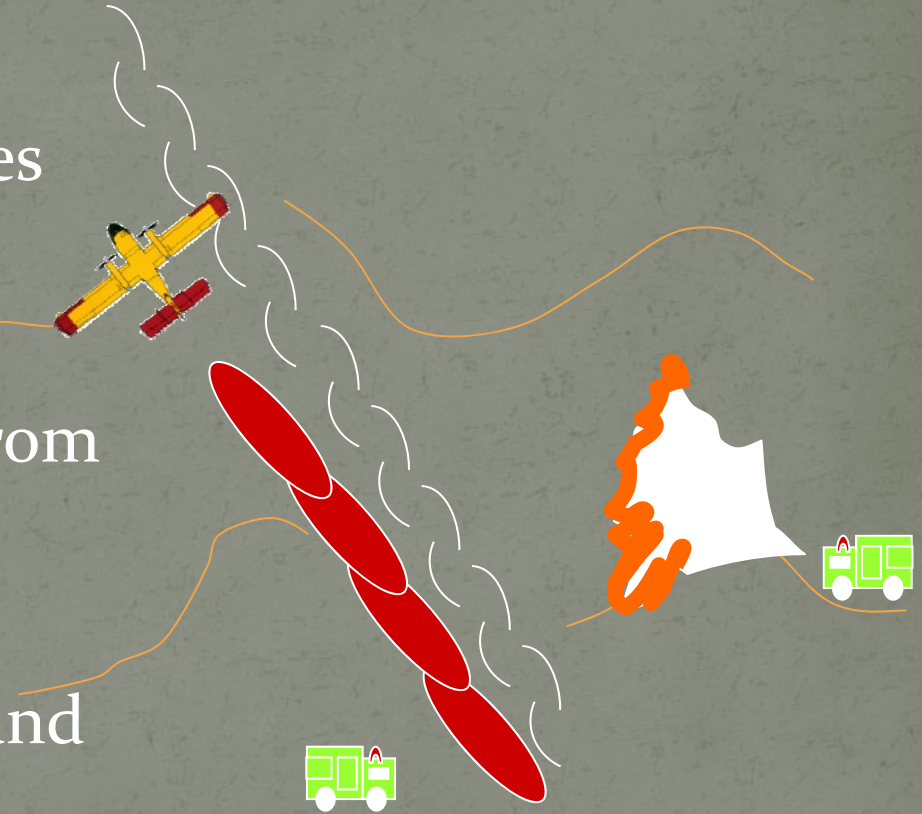
- Three basic methods:
 - Indirect attack
 - Parallel attack
 - Direct attack



Source: Gary Grass

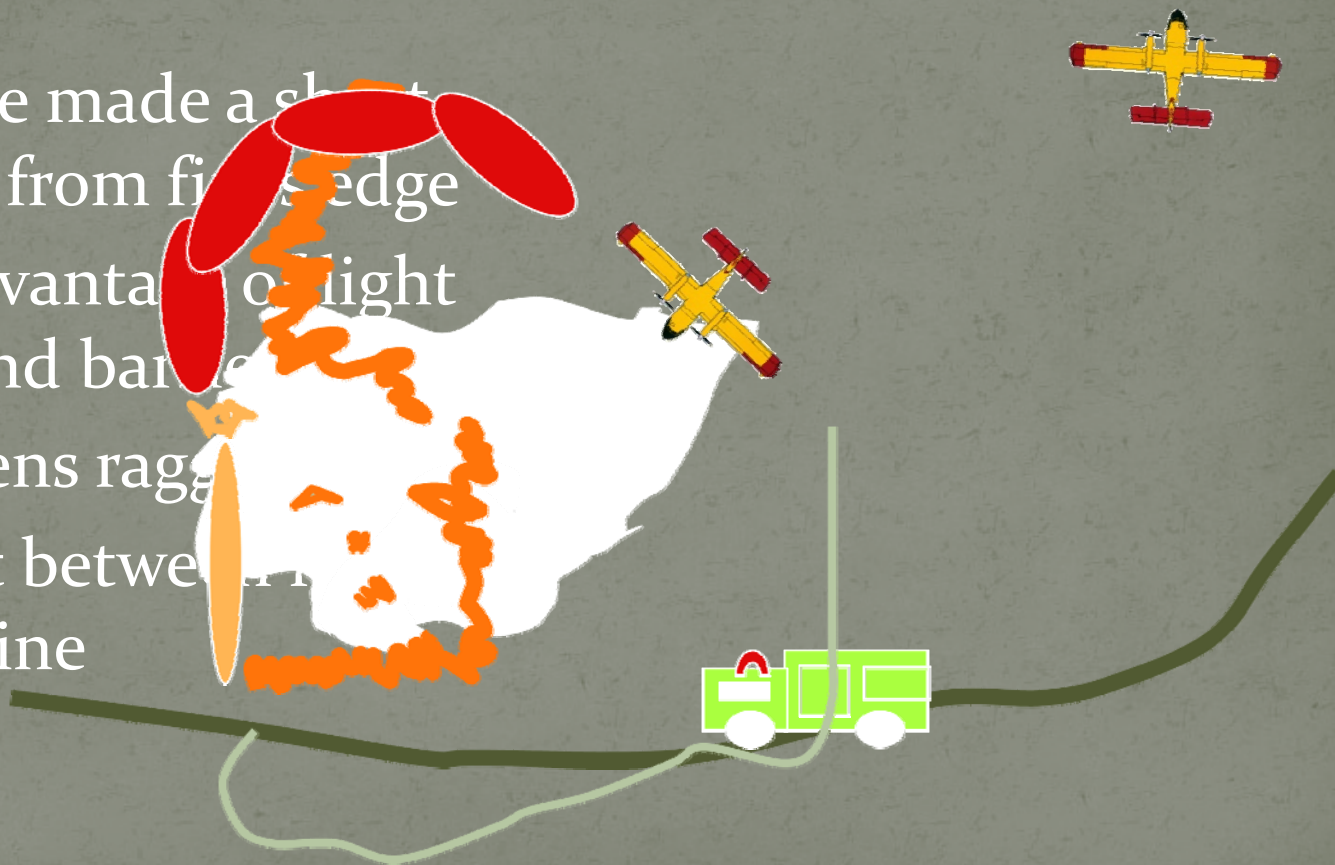
Indirect Attack

- 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



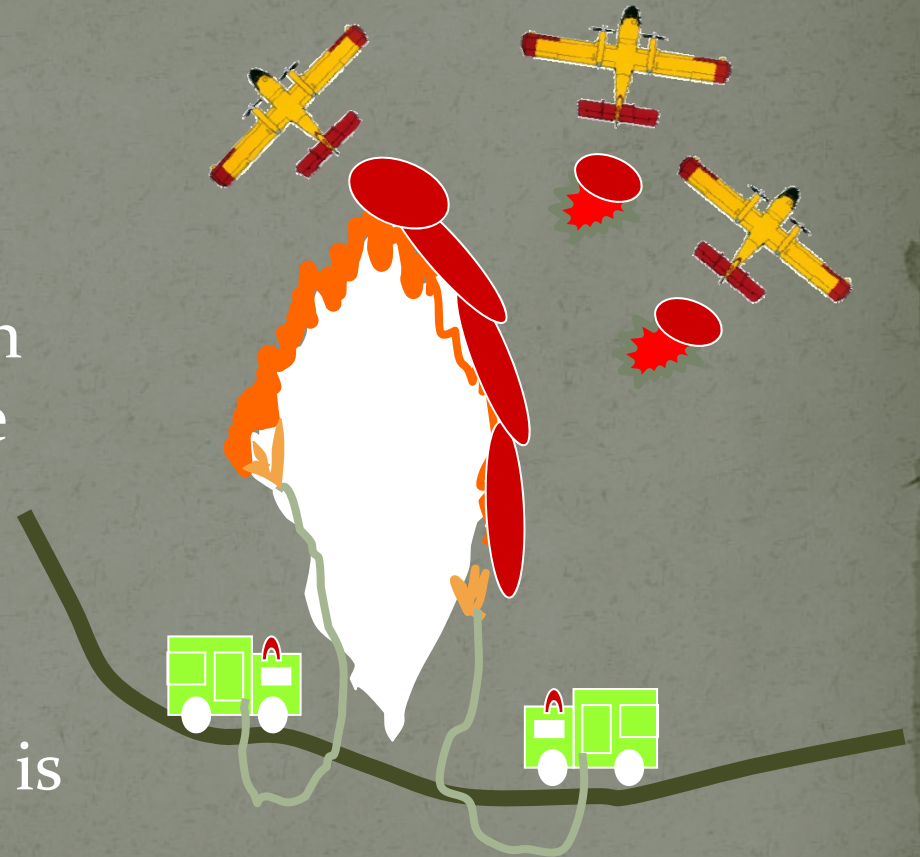
Parallel Attack

- Drops are made a short distance from fire edge
- Takes advantage of light “fuels” and barrier
- Straightens ragged edge
- Burn out between fire and control line



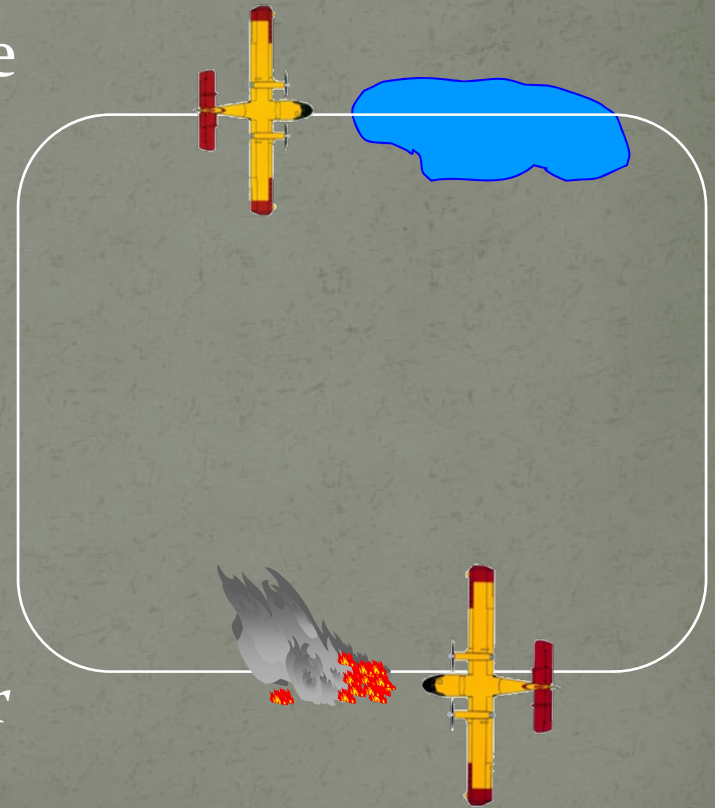
Direct Attack

- 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

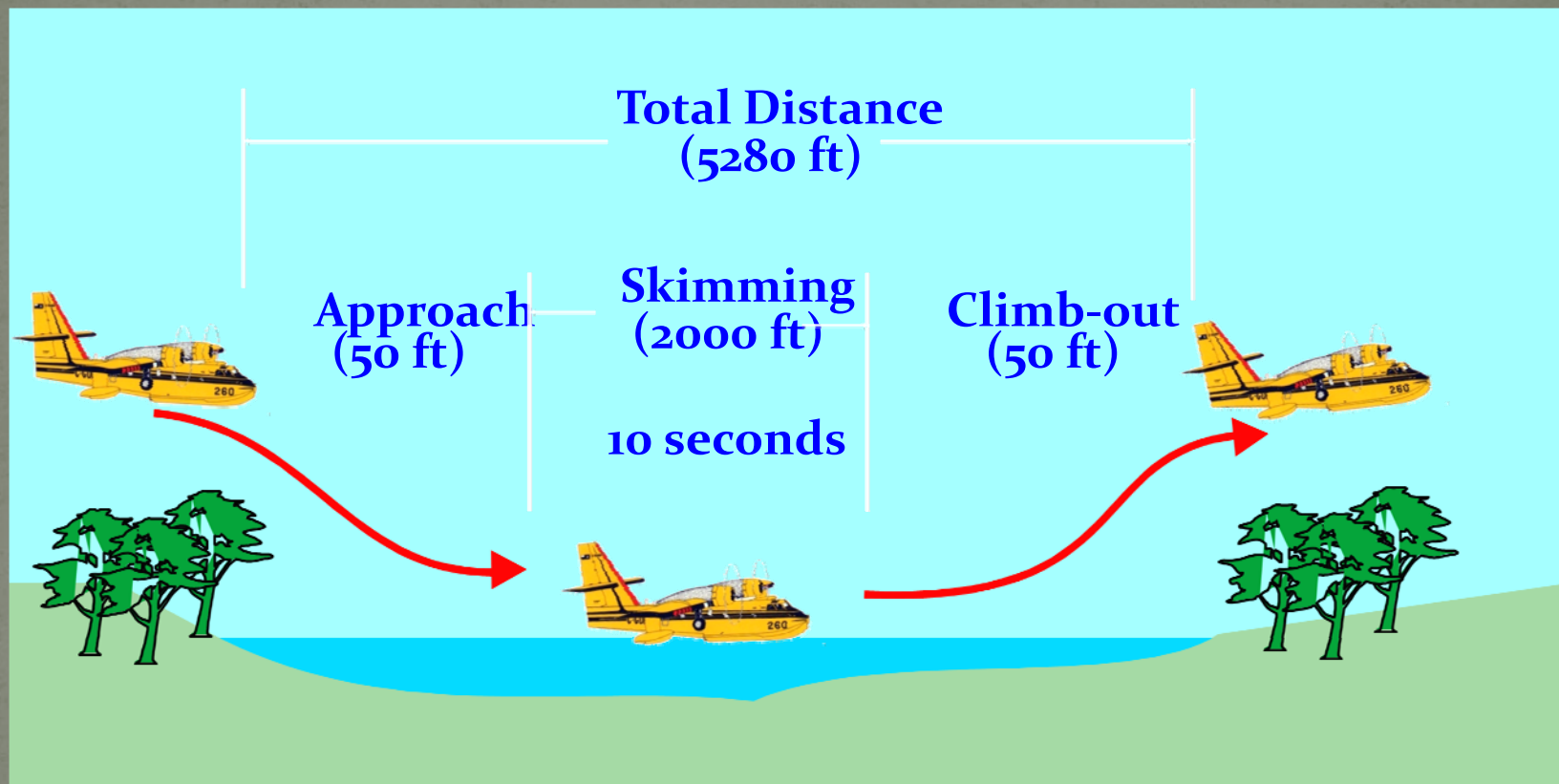


How Scoopers Work

- 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



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

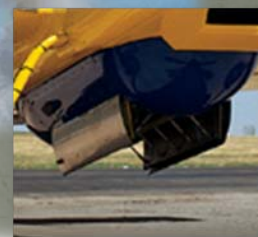
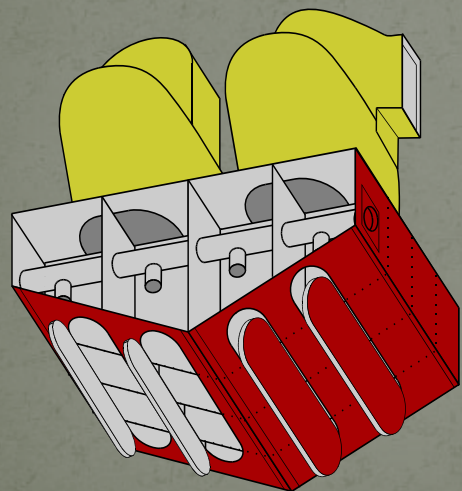
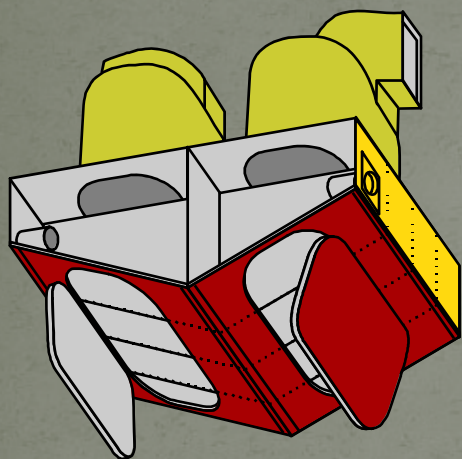


Scoops Down



Scoops Up

Scooper Tank and Door Systems



The Birth of Aerial Fire-Fighting



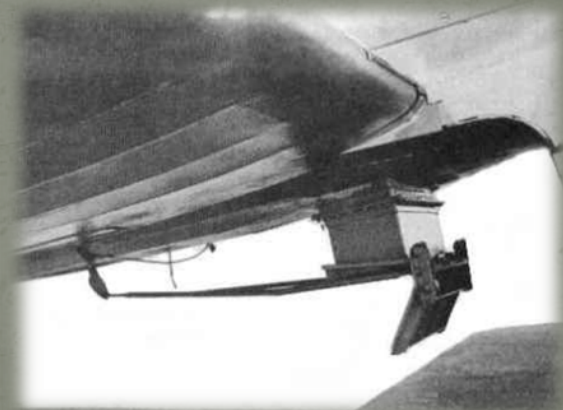
- The U.S. was the leader for land-based air tankers
- Canada led the way for seaplanes and scoopers
- Early air tanker innovators were either ex-military or agricultural pilots
- The U.S.-Canada air tanker race was almost as exciting as the U.S.-Russian “space race”

Aerial Fire-fighting in the USA

- The first U.S. fire-fighting aircraft was developed by Willows Flying Service (California) in **1955**
- Vance Nolte 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



Photos from earlyaviators.com



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

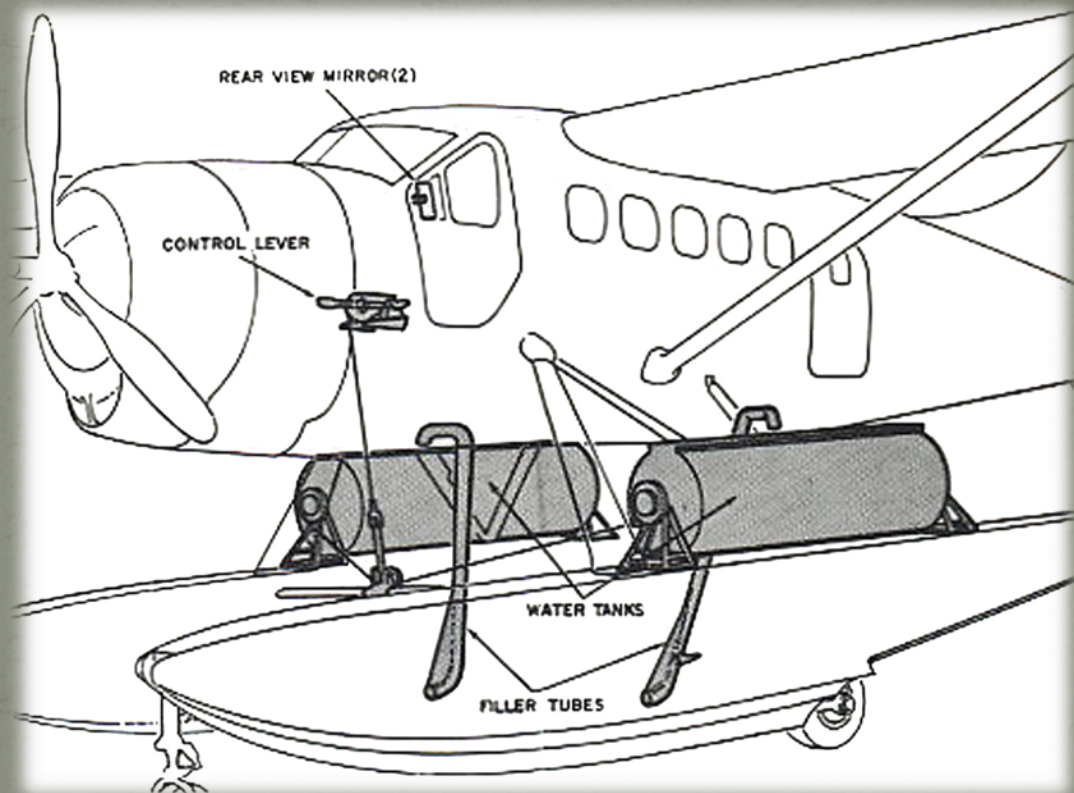
Getting closer ... Flying Boats

- 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



The Scooper Water Bomber is Born

- During the early 1950's, Tom Cook (future OPAS Director) built on Crossley's idea
- Cook and air engineer George Gill mounted two rolover tanks on the top of aircraft floats which could be filled through a fixed snorkel while taxiing on the step



The First Operational Scooper



- 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**

OPAS – The Next Generation

- 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



The Industry Changer – The CL-215



- 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
- Japanese ShinMaywa US-2
 - 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”



Many Thanks

- Ontario Bushplane (and Fire Management) Heritage Center (CBHC) in Sault Ste. Marie, Ontario, Canada
- Ontario Ministry of Natural Resources (OMNR)
- Associated Air Tanker Pilots
- Airliners.net
- Todd Fleet (Curator - CBHC)
- Eric Johnson (PBY and Fire Boss Pilot)
- Gary Grass (Former Mars Pilot)
- Dean Lee (USFS Beaver Pilot)
- Bob Thomas (OMNR Communications – Retired)
- Mitch Miller (OMNR Communications – Fire)
- Walt Darran (Cal Fire S2T Pilot – Retired)

Questions?
