Aerial Application for vector control JS Clayton Aug 2018



Micronair Rotary Atomisers for adulticide and larvicide applications





Types of application:

AERIAL LARVICIDING







After Latham M and Barber J; Outlooks on Pest Management, Aug 2007



Optimal drop size – flying insects





Adult tsetse and mosquito 10-30um



Optimal drop size – Larvicides Mosquito Breeding Sites







50 - 100um Broadcast larvicidfie sprays

200-500um placement sprays

Or applied as granules for dense vegetation













Productivity of different aerial platforms – per sortie

				Adulticides ¹		Larvicides ²	
Туре	Capacity Litre	Flight time	Speed kph	Spray time	Area Ha	Spray time	Area Ha
Multi engine aircraft	2000-5000	6 hrs+	200+	1-3 hrs	10K-20K	n/a	n/a
Twin engine	500- 2000	4 hrs+	200+	1-2 hrs	10K– 15K	15-60min	250 -1000
Fixed Wing - Turbine	1500-2500	4 hrs+	200+	1-2 hrs	10K-15K	30-60min	300-1250
Fixed Wing – Piston	750 -1500	4 hrs+	150+	1-2 hrs	7.5K-12K	30-60min	150-750
Helicopter	500-1000	4 hrs+	50-150	1 hr	2.5K-5K	20min-2hr	125-500
Ultralight	50-100	4 hrs+	50-100	20-40min	400-800	5-40min	12.5-50
UAV < 100Kg	50	1hr	50	15-20 min	300	20-40min	12.5-25.0
UAV < 20 kg	10	30 min	30	5-10 min	75	10-20min	1.25-5.0
UAV < 10Kg	5	20 min	30	5-10 min	40	5-10min	0.6-1.25
UAV < 5Kg	2	20 min	30	2-4 min	15	2-4mins	0.3-0.6

Notes:

1. Adulticides applied at 0.11/ha with 300m swath at 50-100m flying height except UAV's at 100-150m swath

2. Larvicides applied at 2-4I/ha with 50m swath (multi & twin engine, fixed wing),25m (helicopter), 15m (ultralight, 7.5m (UAV <100kg), 5m (UAV < 20kg) at 5-10m flying height



Aerial adulticiding: Case studies

- California (2005) 1.2 m acres sprayed against West Nile Virus following 779 cases and 28 deaths. After application no new cases reported. Analysis indicated 6 fold reduction in transmission following a single aerial application.
- California.(2007). Sacramento and Yolo districts.
 53K acres treated against WNV. 50% reduction in infection rate following single aerial application.
- Thailand (1968) 98% reduction in Aedes mosquito populations following two sequential aerial applications with malathion.
- Haiti (1970's) Aerial sprays in combination with ground space treatments over four weeks saw 75% reduction in malaria incidence.
- Around 10 million acres (2016) treated annually in USA for all mosquito's (M Latham pers comm)





Aerial tsetse operations (2015)

- 4 Ayres Turbo Thrush aircraft
- Spraying late evening
- Use latest GPS overlays to Google [™] Earth
- Micronair rotary atomisers











African aerial tsetse control: Areas treated



Country	Year	Area km²	Sequential Area km ²
Botswana	2001	7,128	35,640
Botswana	2001	8,560	42,800
Botswana, Namibia, Angola, Zambia	2006	10,000	50,000
Angola & Zambia	2009	10,000	50,000
Ghana & Burkina Faso	2010	8,680	50,000
Ethiopia	2012	5,000	34,720
Zambia	2014	6,300	20,000
Total			264,660



Liquid larvicide Application

Comparison of Drop Size and penetration of Foliage











Study on Spray penetration into dense canopies



Aerial Larvicide Application



- Major potential to selectively treat identifiable breeding areas with liquid or granular larvicides early season to break development cycles, Granules penetrate dense foliage better than liquids.
- Aerial larviciding overcomes constraints in accessing and treating breeding areas in a timely manner and developments in GIS allows for greater accuracy in targeting specific sites
- Broadcast aerial larviciding may overcome difficulties associated with finding all potential breeding sites
- may be an effective tool to target outdoor mosquito and address the transmission 'gap' when using bed nets and IRS
- Larvicides offer very effective insecticide resistance management as they have different modes of action compared to conventional contact insecticides. No known reported cases of resistance found to date.
- Can use Bti biologicals- environmentally benign



Modern UAV's Improved stability, GPS mapping, new power units, sensing technologies



Micromiser – Electric rotary atomiser for UAV's

- low power < 10 watts (6-24V)
- lightweight (<250g) and small in size (55 x105mm)
- uniform drop size
- flow rates up to 500 ml/min
- electronically adjustable drop size 50-400um VMD
- brushless motor technology continuously rated







Aerial Ag Aircraft Capacity by Region

Region	Number of Spray Aircraft
North America	5,605
Central America	202
South America	3,836
Europe	89
Africa	200
Middle East	31
Central Asia	292
Far East	768
Australasia	314
Total	11,298



Spray aircraft - Africa





Maximum productivity of different aerial platforms per day

	Adulticides Ha	Larvacides Ha
Multi engine aircraft	20,000	N/A
Twin engine	12,000	1,000
Fixed Wing - Turbine	12,000	1,000
Fixed Wing – Piston	8,000	750
Helicopter	3,000	500
Ultralight	1,000	50
UAV < 100Kg	700	50
UAV < 50Kg	450	35
UAV < 20 kg	200	20
UAV < 10Kg	150	10
UAV < 5Kg	75	6



Productivity of different aerial spray platforms per day Adulticides



MiCRON GROUP

adulticides

General Conclusions

• Aerial spray capacity for mosquito control already exists or can be easily mobilised in most African and other malaria endemic regions

 Many aerial operators in Africa and elsewhere are already experienced in ULV aerial spraying techniques and are equipped with latest GPS guidance

• Manned aircraft offer significantly higher productivity compared to unmanned smaller UAV's (<100kg)

 UAV's offer greater autonomy and ability to launch aerial operations at local level with minimum support structure – air strips, fuel tankers and so on.

•Aerial operational costs are competitive. In Africa US\$12-20 /ha for larviciding and around US \$0.5- 2 / ha adulticiding plus chemical costs

