EMERGING TECHNOLOGIES IN CROP SPRAYING USING SMALL UNMANNED AIRCRAFT

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PROGRAM

- BACKGROUND AND POTENTIAL APPLICATION
- OVERVIEW OF sUAS AERIAL SPRAY SYSTEM
- VERY INITIAL SPRAY TEST RESULTS
- REGULATIONS
- SYNTHESIS AND YOUR THOUGHTS

BACKGROUND

- UNMANNED AIRCRAFT CONTINUE TO EMERGE AS DISRUPTIVE INNOVATION
- PRIMARY PROFILE IS FOR ENHANCED CROP SCOUTING - REMOTE SENSING
- LIGHT WEIGHT PHANTOM CLASS MACHINES

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- IMPLICATIONS FOR "DATA DRIVEN DECISION MAKING" AND "SAFETY"

BACKGROUND

- YAMAHA R-MAX UNMANNED AIRCRAFT SPRAY SYSTEM

BACKGROUND

- YAMAHA R-MAX UNMANNED AIRCRAFT SPRAY SYSTEM
- WEIGHT OVER 55 LBS
- EXCEED THE "SMALL UNMANNED AIRCRAFT SYSTEM" THRESHOLD
- DOESN'T FALL WITHIN THE FRAMEWORK OF THE PART 107 REMOTE PILOT CERTIFICATE
- MORE COMPLEX AND EXPENSIVE CERTIFICATION PROCEDURES
- COMPANIES BEGINNING TO OFFER sUAS QUALIFIED SPRAYERS

OVERVIEW OF sUAS SPRAY SYSTEM

- 55 POUND WEIGHT LIMIT !!

OVERVIEW OF sUAS SPRAY SYSTEM

- DJI MODEL MG-1 AGRAS sUAS SPRAY SYSTEM

OVERVIEW OF sUAS SPRAY SYSTEM

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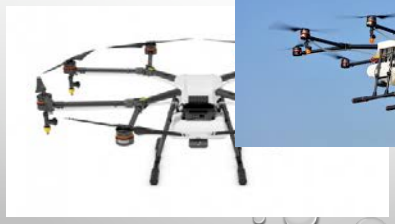

OVERVIEW OF sUAS SPRAY SYSTEM

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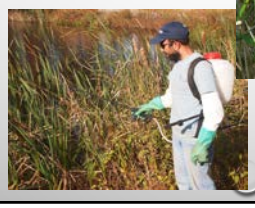
MISSION PROFILE sUAS SPRAY SYSTEM

- SPOT SPRAYING
- EDGE SPRAYING
- INVASIVE SPECIES
- EARLY INFESTATION

MISSION PROFILE sUAS SPRAY SYSTEM

- DIFFICULT ACCESS



OVERVIEW OF sUAS SPRAY SYSTEM

VERY INITIAL (DRAFT) SPRAY TEST

- SPRAY TEST PROCEDURES
  - 6 SPRAY CARDS ON 2 METER (6.5 FEET) SPACING
- 4 EACH TEEJET XR 11001VS NOZZLES (SQUARE CONFIGURATION)
- GROUNDSPEED = 13.8 KPH (7.5 KTS)
- HEIGHT = 3.2 METER (10.5 FEET)
- WIND = 16 KPH (8.7 KTS)
- TEMPERATURE = 7 ^{0}C (45 ^{0}F)

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- FLOW RATE = 1.66 L/MIN (0.43 GPM)

VERY INITIAL (DRAFT) SPRAY TEST

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- CARDS FROM LEFT (1) TO RIGHT (6)

(1)

VERY INITIAL (DRAFT) SPRAY TEST

- CARDS FROM LEFT (1) TO RIGHT (6)

(2)

VERY INITIAL (DRAFT) SPRAY TEST

- CARDS FROM LEFT (1) TO RIGHT (6)

(3)

VERY INITIAL (DRAFT) SPRAY TEST

- CARDS FROM LEFT (1) TO RIGHT (6)

(4)

VERY INITIAL (DRAFT) SPRAY TEST

- CARDS FROM LEFT (1) TO RIGHT (6)

(5)

VERY INITIAL (DRAFT) SPRAY TEST

- CARDS FROM LEFT (1) TO RIGHT (6)

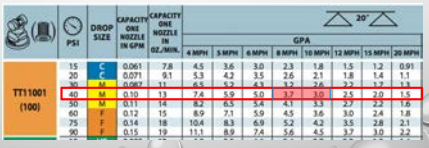
(6)

VERY INITIAL (DRAFT) SPRAY TEST

- APPLICATION RATE BASED ON TEST RESULTS
- ASSUMING 3 METER (9.8 FT) EFFECTIVE SPRAY WIDTH
- 24 L/Ha
- ASSUMING 2 METER (6.6 FT) EFFECTIVE SPRAY WIDTH
- 36 L/Ha

VERY INITIAL (DRAFT) SPRAY TEST

- APPLICATION RATE BASED ON TEEJET DATA
- CORRECTION FOR DOUBLE NOZZLES AND SPACING
- 60 L/Ha



PSI	DROP SIZE	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	GPA 20" 4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH	15 MPH	20 MPH
TT11001 (100)											
15	C	0.061	7.8	4.5	3.6	3.0	2.3	1.8	1.5	1.2	0.91
20	C	0.071	9.1	5.3	4.2	3.5	2.6	2.1	1.8	1.4	1.1
30	M	0.087	11	6.5	5.2	4.4	3.3	2.6	2.2	1.7	1.3
40	M	0.10	13	7.4	5.9	5.0	3.7	3.0	2.5	2.0	1.5
50	M	0.11	14	8.2	6.5	5.4	4.1	3.3	2.7	2.2	1.6
60	F	0.12	15	8.9	7.1	5.9	4.5	3.6	3.0	2.4	1.8
75	F	0.14	18	10.4	8.3	6.9	5.2	4.2	3.5	2.8	2.1
90	F	0.15	19	11.1	8.9	7.4	5.6	4.5	3.7	3.0	2.2

REGULATIONS

- VERY DIFFICULT TO MEET CURRENT FEDERAL AVIATION REGULATIONS
- NEED PART 107 PILOT CERTIFICATE
- NEED PART 137 PILOT CERTIFICATE
- NEED TO REQUEST WAIVERS FOR BOTH PART 107 AND 137 REGS

SYNTHESIS

- EMERGING TECHNOLOGY
- SOME POTENTIALLY COMPELLING APPLICATIONS
- CURRENT REGULATIONS INTRODUCE CHALLENGES
  - WILL PART 137 PILOT WANT TO FLY sUAS SPRAYER ?
  - IF NOT, WHO WILL FLY THE AIRCRAFT BEING SOLD ?
- IF FLIGHTS ARE OUTSIDE REGULATIONS, IS SAFETY COMPROMISED ?
- IDEAS & SOLUTIONS ?

THANK YOU

- RECOGNIZE COLLEAGUES
  - DR. ROBERT WRIGHT (ENTOMOLOGY)
  - DR. JUSTIN MCMECHAN (ENTOMOLOGY)
  - DR. TAMRA JACKSON-ZIEMS (PLANT PATHOLOGY)
  - DR. GREG KRUGER (AGRONOMY)
  - DR. CHRISTOPHER PROCTOR (AGRONOMY)

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