Improving Workplace Safety with Drones

Michael Olvera – Remote Systems Operator

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Cargill - Remotely Operated Systems

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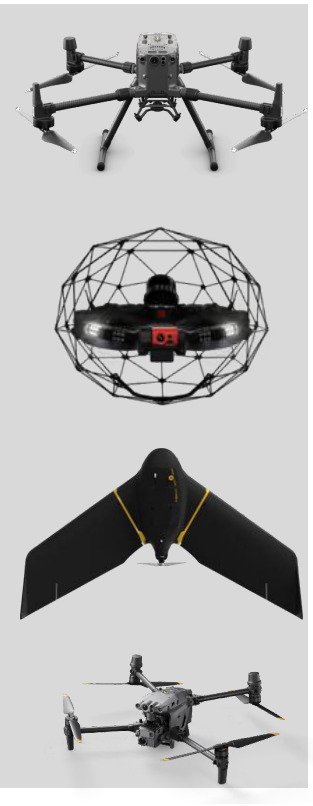
Drone Program Profile

- **40 Drones Globally**
- **Team of 15 Employees**
- **Primary Use Cases:**
  Asset Inspections, Security, Crop Analysis & Mapping
- **North America & LATAM RPAS Teams**
- **Conduct RPAS Ops Globally**

WHY DRONES?

- Improved Safety For Workers
- Cost Savings
- Digital Libraries
- Efficiencies



How Drones Improve Safety and Reduce Hazardous Hours

Improving Inspection Safety

Protect Workers and Accomplish Dangerous Tasks

Drones reduce inspection risk in many ways:

- Three D's: Dull, Dirty & Dangerous Environments
- Improved organizational health & safety performance
- Considered expendable, can be used in situations that risk is not acceptable for humans
- Partial or full removal of Human Factor risks & errors
- Inspect areas that were previously high risk, or inaccessible to humans

Hazardous Situation Examples

Drones Provide a Significant Reduction in Hazardous Work Hours

Examples of high-risk situations & safety benefits:

- Confined space entries
- Repel access inspections
- Scaffolding and ladder construction
- Eliminating concern of grain entrapment
- Reducing hours worked on lifts, ladders & cranes

Drone Hardware Solutions

Internal Asset Inspections – Elios 3

The Elios 3 can inspect critical internal assets in a cost effective, safe manner

- 4K RGB sensor for high resolution image and video collection with 180-degree unobstructed view
- 16k lumens dust-proof lighting provides more than enough light to illuminate the darkest areas
- Visual camera stabilization allows the system to hold its position without input from the operator
- SLAM with use of LiDAR improves situational awareness in the moment along with visualizing the asset post inspection

External Asset Inspections – M30T

The M30T excels at performing both Visual and Thermal inspections

- 8K RGB sensor captures high quality images of features at a safe standoff with 200x zoom (16x optical – 200x digital)
- Thermal imagery comes out clear and is easily compared to RGB images with side-by-side views
- Maximum flight time of 45 minutes enables you to complete grain structure inspections in one or two flights

Cargill Owned & Operated - Drone Technology

								
DJI Phantom 4 & RTK	**DJI Mavic Enterprise**	**DJI Matrice 210**	**DJI Matrice 300**	**DJI Inspire II**	**DJI Matrice 30T**	**Flyability ELIOS 2**	**Flyability ELIOS 3**	**Sensefly Ebee X**
$15,000	$5,000	$30,000	$40,000	$15,000	$20,000	$48,000	$54,000	$52,000
U.S.	U.S. & Brazil	U.S.	U.S. & Canada	U.S. & Thailand	U.S.	U.S.	U.S.	U.S.
Mapping & Volume Metric Surveys	External Asset Inspections, Security & Aerial Photography	External Asset Inspections & Photography	External Asset Inspections, Photography, LiDAR	Inventory Counting & Cinematography	External Asset Inspections & Photography	Internal Asset Inspections & Mine Surveys	Internal Asset Inspections & Mine Surveys	Mapping, Multispectral surveys & Volume Metrics
2019 Tech	2018-2020 Tech	2018 Tech	2020 Tech	2018 Tech	2021 Tech	2019 Tech	2022 Tech	2018 Tech

Example Use Cases

Potential Use Cases

Stockpile - Volumetric Surveys

Crop Health Analysis

Aerial Cinematography

Asset Inspection

Aerial Mapping & Digital Twins

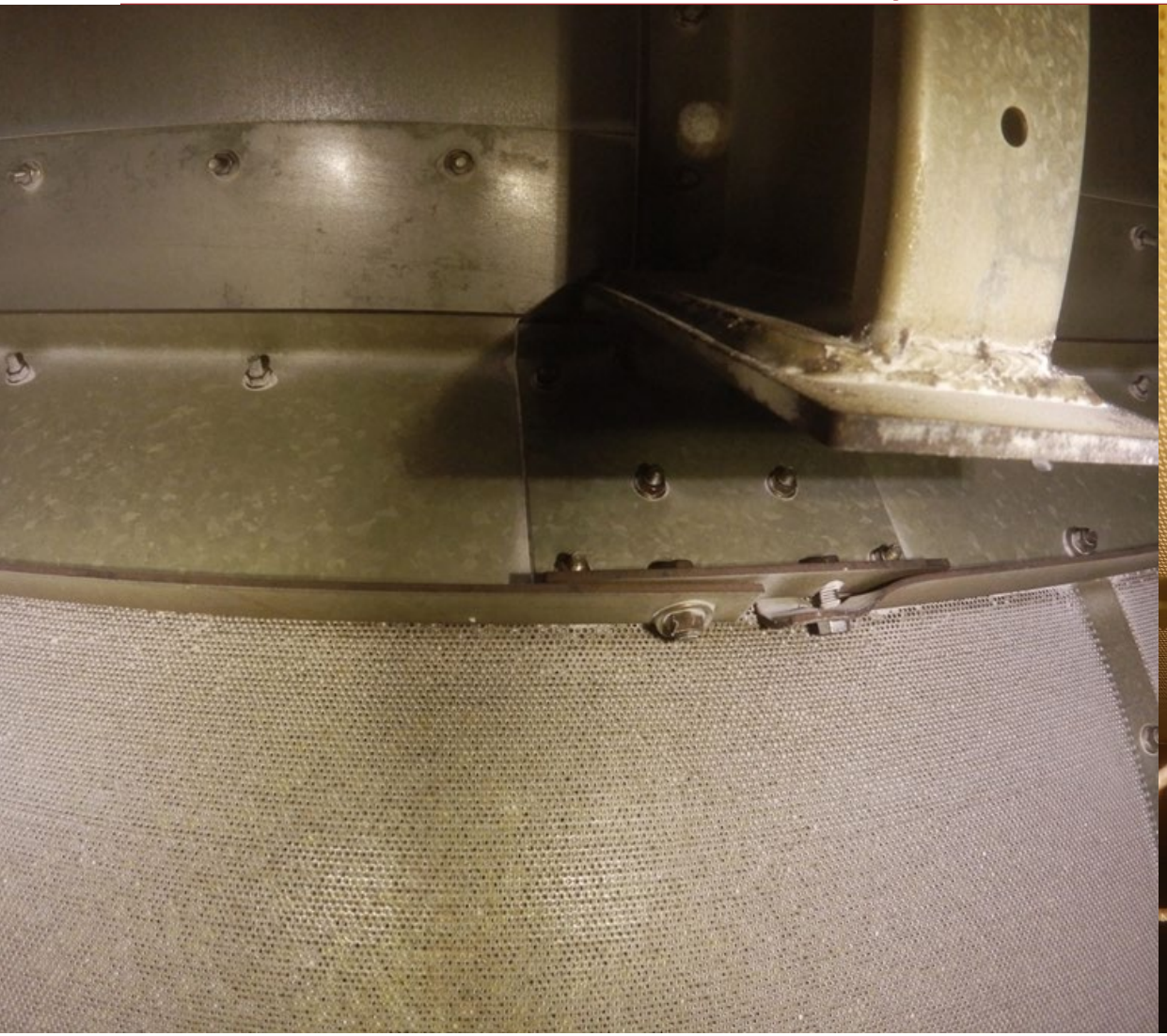
Security Operations

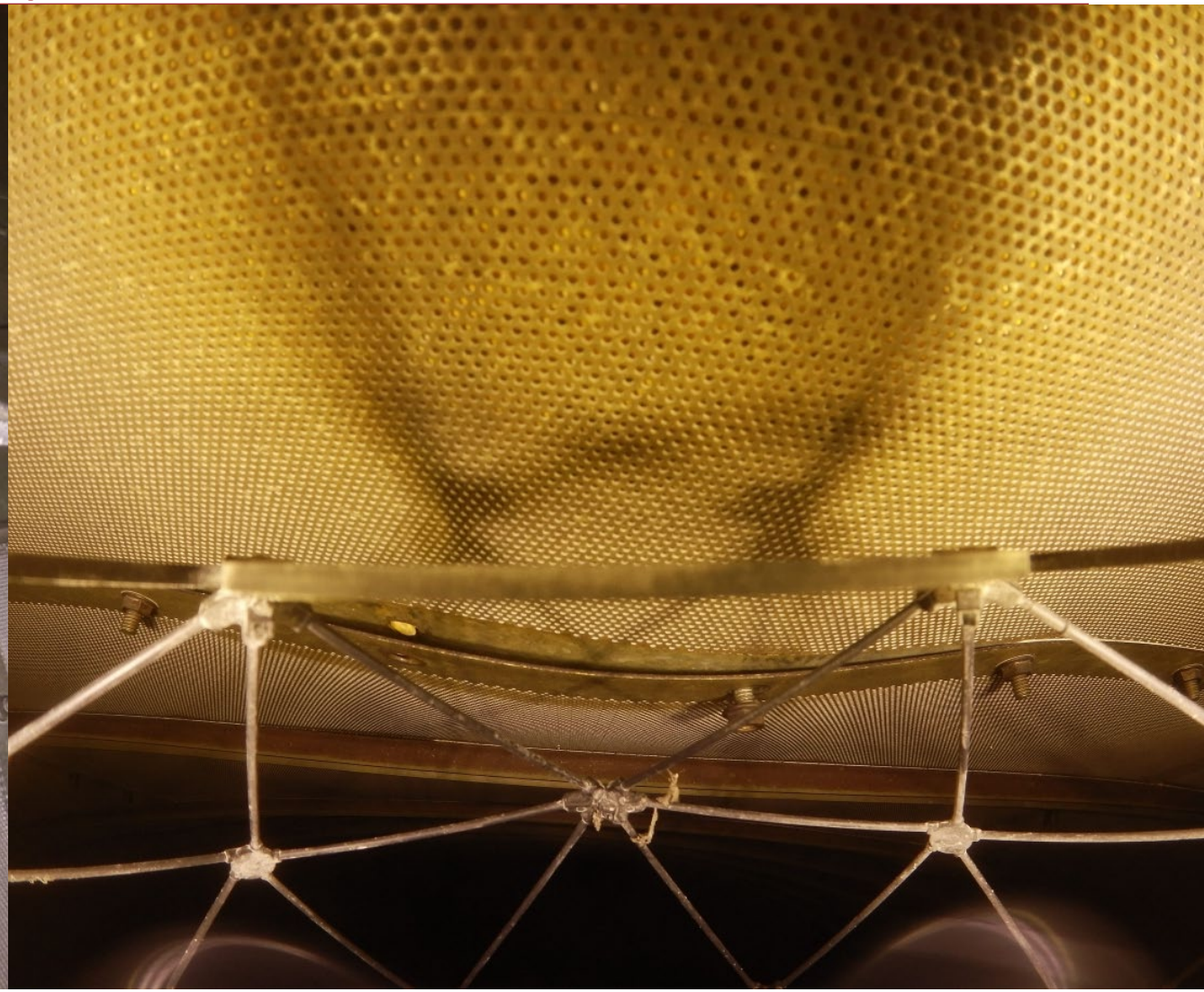
External Grain Bin Inspection

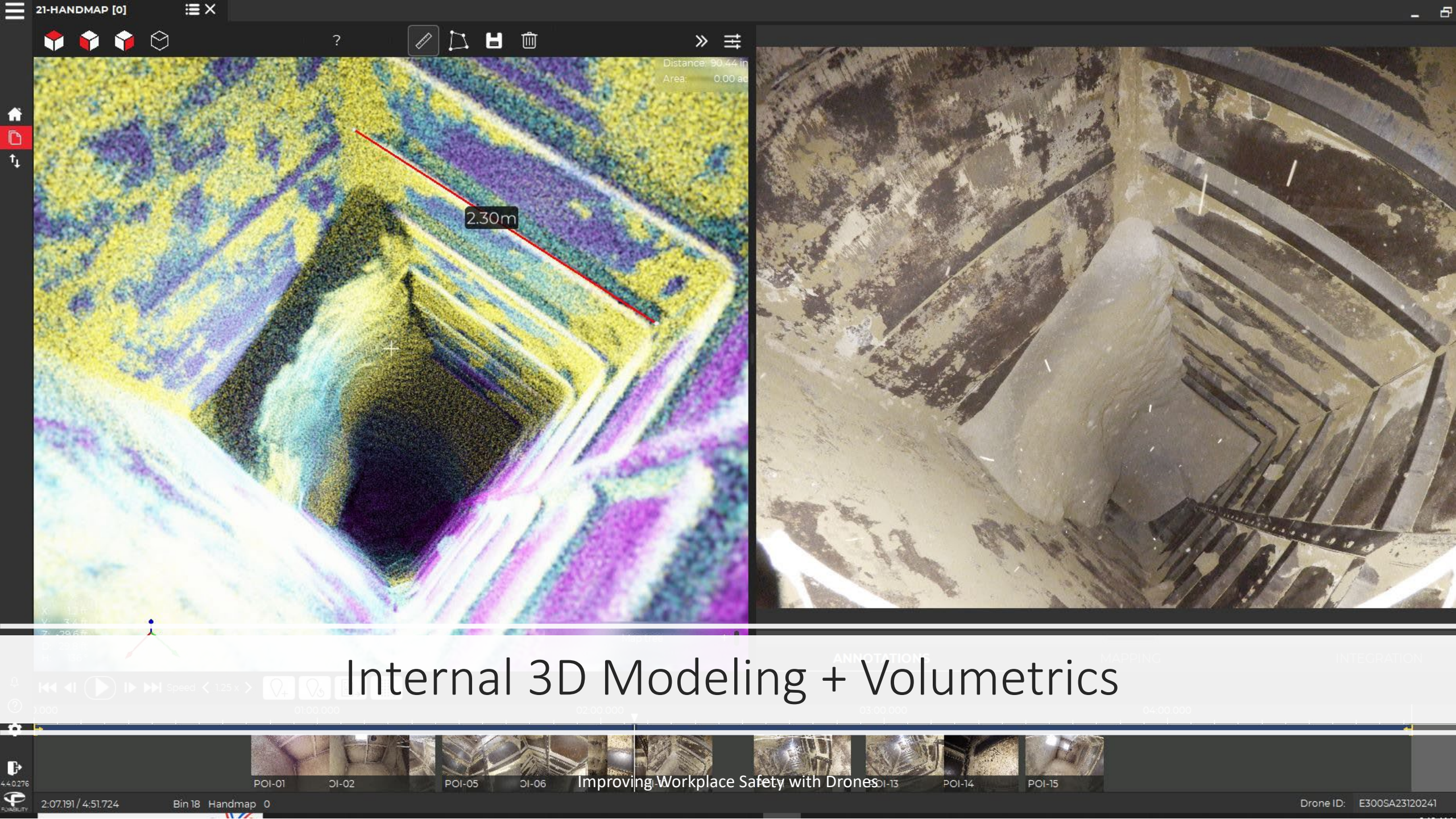
External Grain Bin Inspection

Internal Grain Bin Inspection

Internal Grain Dryer Inspection







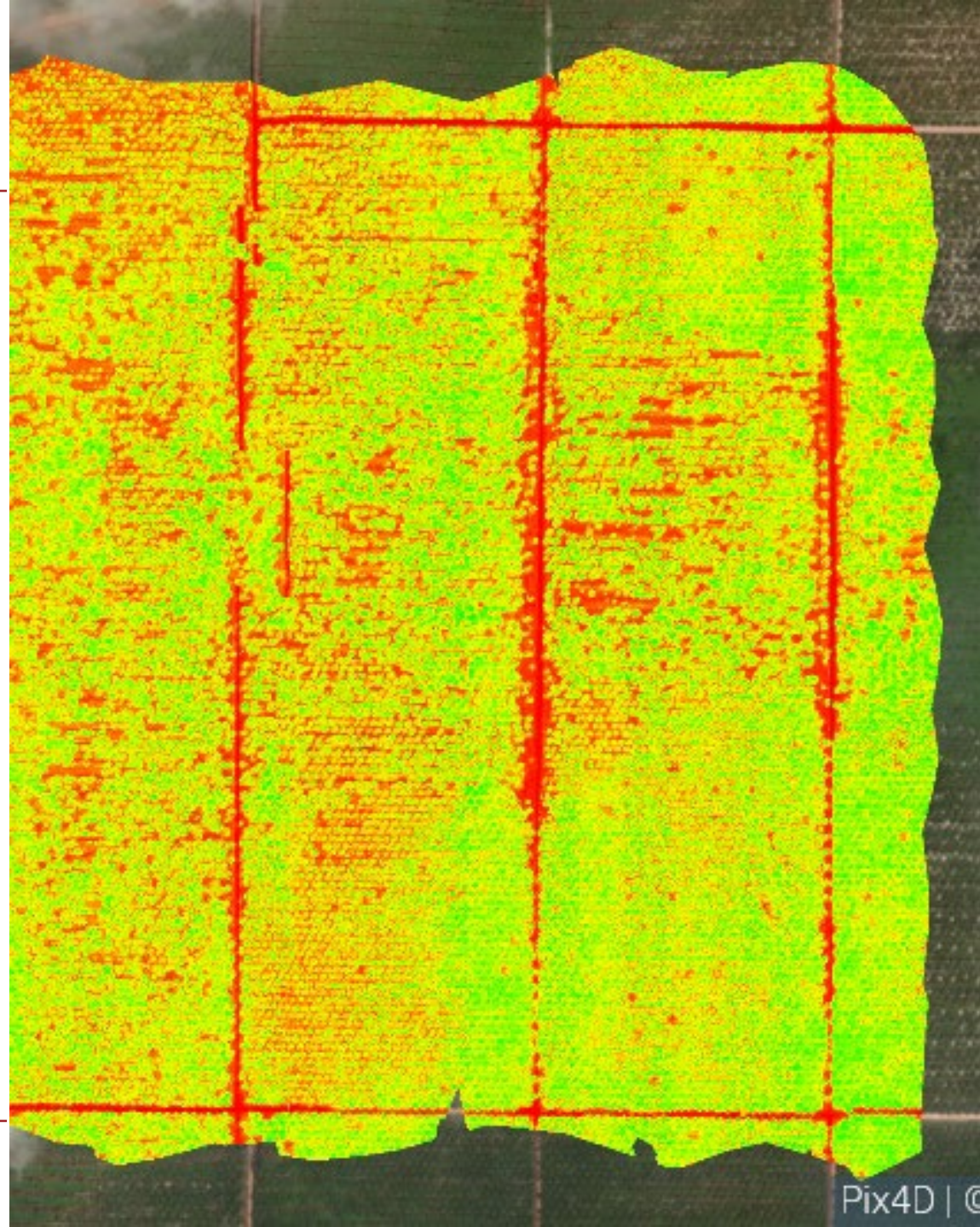
Internal 3D Modeling + Volumetrics

Crop Health Analysis

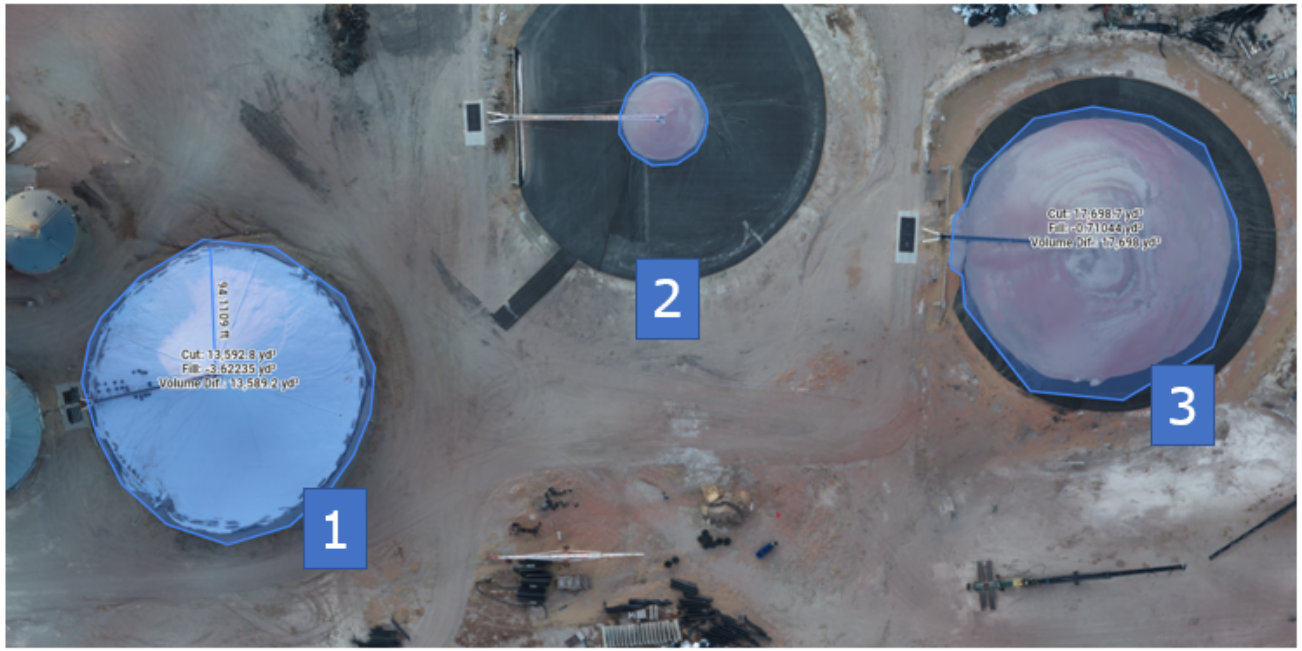
Multispectral sensors provide insight into crop health

- Types of sensors:
  - RGB (Visual Sensor): Field mapping, crop count, weed detection, canopy cover
  - NDVI (Infrared): Crop health, elevation / hydrology, density and greenness of vegetation
    - Early stages of crop growth
  - NDRE (Near-red): Chlorophyll content and total biomass, crop health
    - Late stages of crop growth

NDRE of Palm Tree Plantation in Indonesia →



Cheyenne Wells, Colorado – 10 December 2020 (Survey Conducted at 4:30 PM Local Time)



Pile Number	Product Type	Cubic Yard Survey	Pack Factor	(-) Foreign Material & Waste	Total	Total Bushels	Total Weight (W/ MC Factor)
1	Sorghum	13,589.2 yd³	.012	.008	13,644 yd³	296,184	16,586,304 Lbs
2	Sorghum	737.7 yd³	0	.003	735 yd³	15,955	893,480 Lbs
3	Sorghum	17,698 yd³	.015	.003	17,910 yd³	388,790	21,772,256 Lbs

Note: Pack Factor Data From: https://www.fsa.usda.gov/Internet/FSA_File/8lp2-a6.pdf
USDA Conversion Chart: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_022760.pdf
Bushel Conversion Formula: 1 cubic yard = 21.708 Bushels | 1 Bushel of corn & Sorghum = 56 lbs |

Any questions?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