

# HOW TO BUILD A DRONE PROGRAM



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**WEDNESDAY, April 22, 10:30 A.M. EDT**

# Topics of Discussion

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- **Cargill at a Glance**
- **Understanding the Drone Eco-System**
- **Cargill's Organizational Approach to Drones**
- **Starting Points for Execution**
- **Example Charter Initiative for a Drone program**
- **Defining Return on Investment (ROI) Qualifiers**
- **Example of Drone Technology Opportunities**
- **Example use cases & ROI's**
- **Final Thoughts**

# Cargill at a Glance

Our purpose is to nourish the world in a safe, responsible and sustainable way. Every day, we connect farmers with markets, customers with ingredients, and people and animals with the food they need to thrive. We combine our experience with new technologies and insights to serve as a trusted partner for food, agriculture, financial and industrial customers in more than 125 countries.

- 160,000 employees
- Working in 70 countries
- More than 150 years Experience
- 6 Business Units
- 5 Internal Function Teams



## Agriculture

We connect producers and users of grain, oilseeds and other agricultural commodities through origination, processing, marketing, risk management and distribution. We also provide crop and livestock producers with farm services and products.



## Animal Nutrition and Protein

We deliver animal nutrition products and services to producers in aqua, beef, dairy, pork, poultry and pet food. We also offer a full range of meat and poultry products to food companies and retailers.



## Food

We serve food manufacturers, foodservice companies and retailers with high-quality food and beverage ingredients, applications and services. We also provide raw materials for animal nutrition and industrial applications.



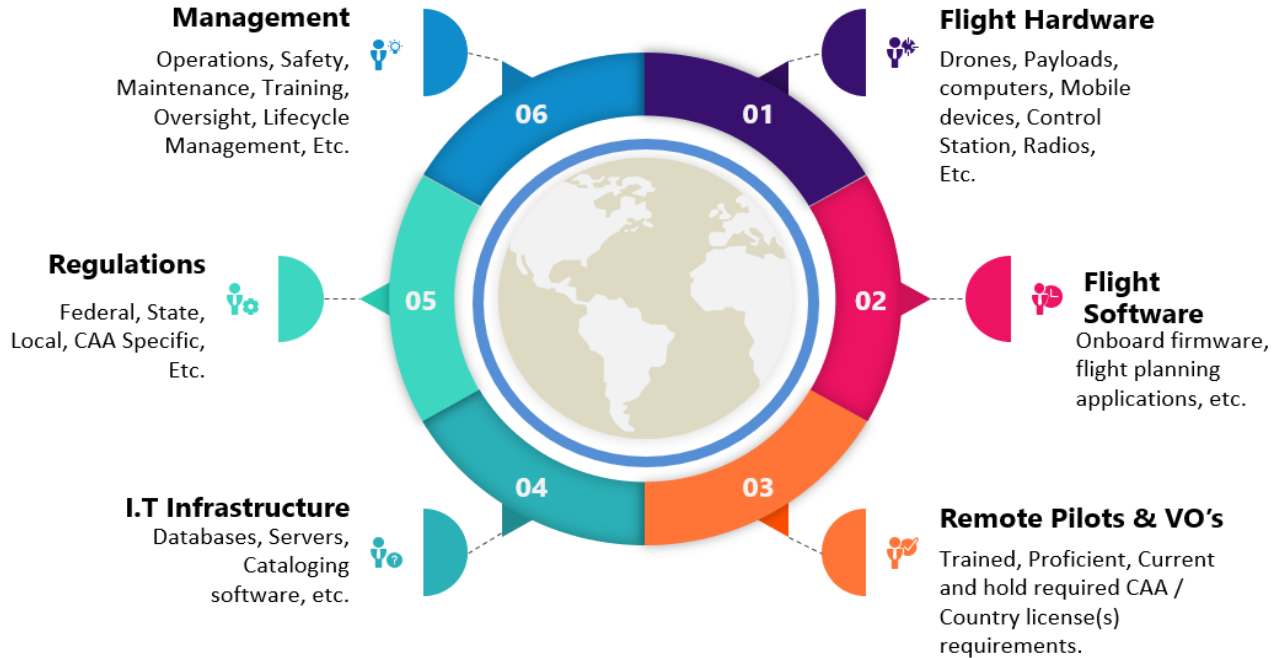
## Financial and Industrial

We provide Cargill customers and the company with risk management in energy, metals, ocean freight and commodities. We also offer financial solutions that facilitate trade and mitigate trade-related risks.

### CONNECTING FARMERS WITH FOOD, FEED AND INDUSTRIAL CUSTOMERS

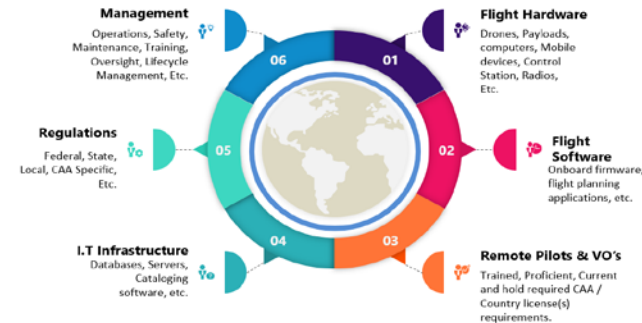


# Unmanned Systems – Eco-System



# Organizational Approach to Drones

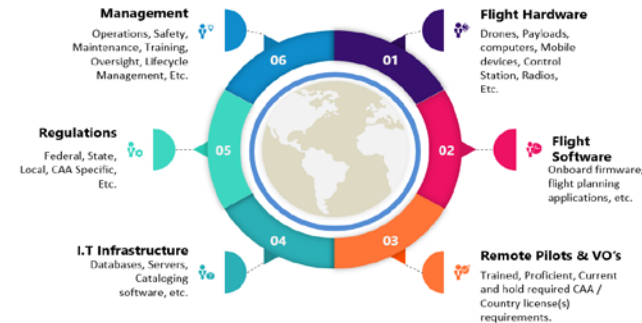
- Identify the Program & Risk Owners. (Corp. Aircraft, I.T. Team, Service Team, Etc.)
- Incorporate Internal Functional Teams and Request Support. (Insurance, I.T., Legal, EHS, Etc.)
- Develop Corporate Governance and Ensure Compliance with applicable Laws.
- Create Standardized Processes & Procedures that align with Industry Best Practice.
- Educate Leadership and Provide Awareness on how drones can Benefit the Organization.
- Create a robust communication and training program.
- Develop a sound approach to data management.
- Follow Safety Management System (SMS) Methodology.



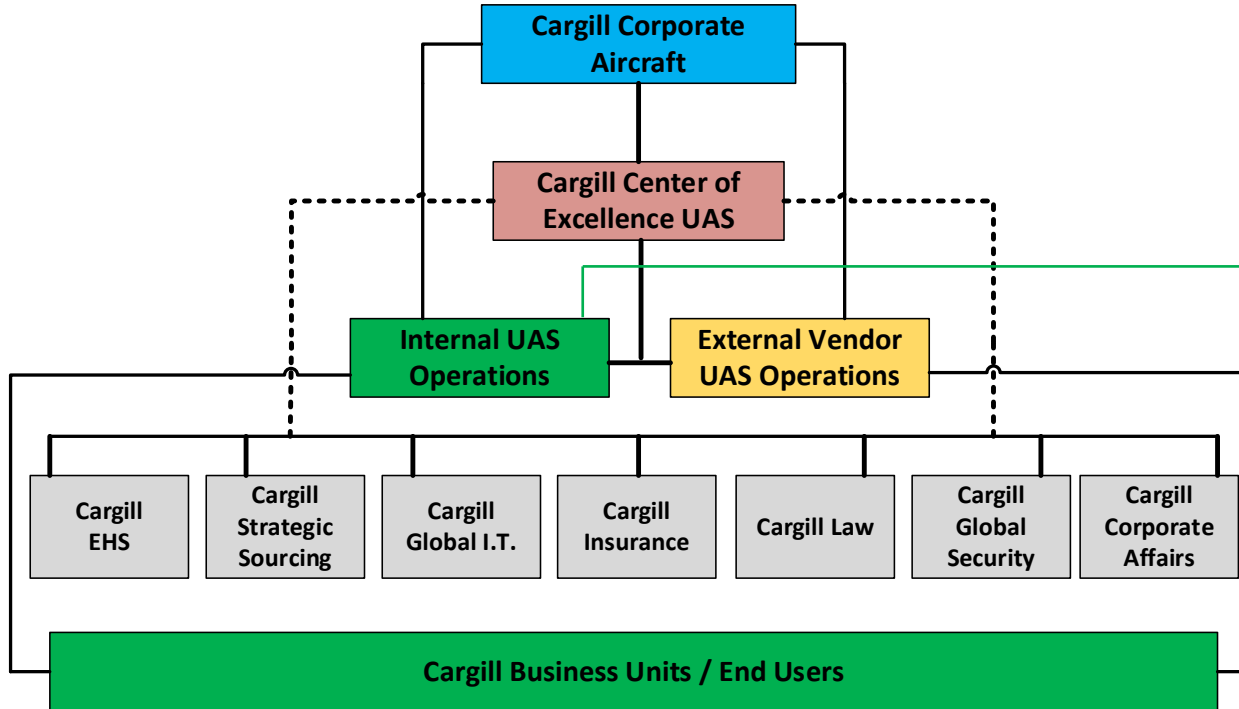
# Organizational Approach to Drones

## Core Mission & Goals:

- Ensure all organic and third-party operated unmanned system operations are in compliance with all applicable CAA, Federal, State and local Laws. Obey the law.
- Manage the associated risk of operating unmanned systems through the use of a safety management system, governance and training. Zero accident rate goal.
- Enable & provide Cargill with new and actionable data by utilizing unmanned system technology. Be innovative and maintain the competitive edge to thrive.
- Utilize Aerial Drones within Cargill in accordance to the following priorities:
  1. Reduce risk and hazards to Cargill (Employees, Brand, Assets, Etc.)
  2. Cost savings, efficiency gains & better decision making
  3. Ability to provide situational awareness & imagery in a quick manner
  4. Precise inspection data in digital form for data systems (SAP)
  5. Validation tool to ensure accuracy of reporting or decision making

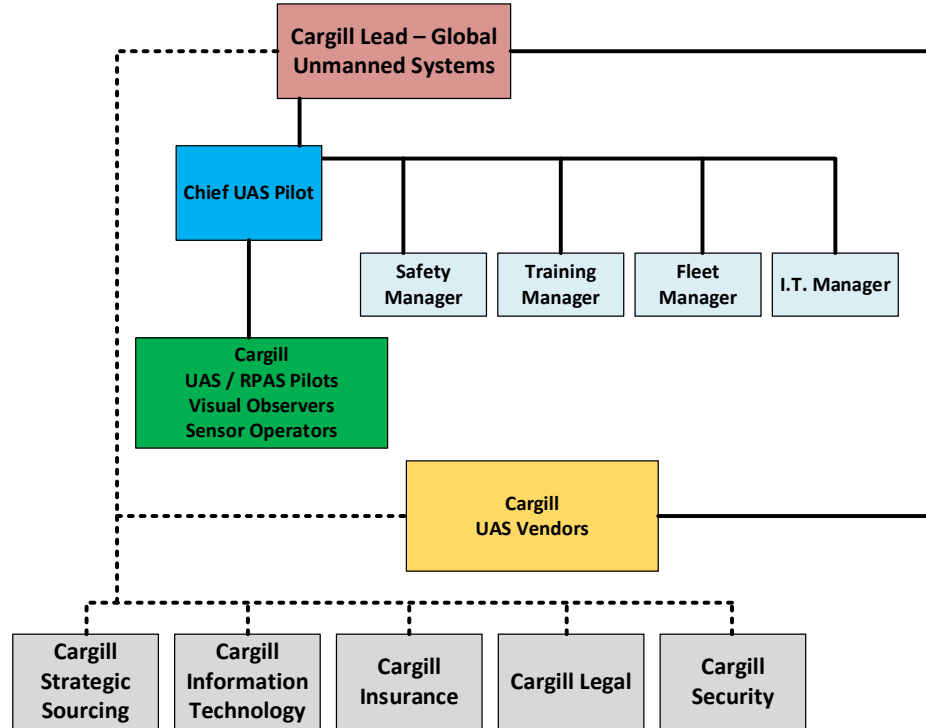


# Organizational Chart



- Corp. Service Model (Regionalized) serving all of Cargill
- BU / Functional Service Delivery
- Site Specific Operated

# Organizational Chart – Level 3





# Set Defined Capabilities & Responsibilities

UAS Policies & Practices	UAS Education & Training	UAS Safety	UAS Delivery & Operations	UAS Systems	UAS Data
UAS Policies	UAS Training & Delivery	UAS Safety & Risk Management	UAS Internal Delivery & Operations	UAS Solution Design	UAS Data Acquisition
UAS Compliance	UAS Awareness & Promotion	UAS Supplier Assessments & Reviews	UAS External Delivery & Operations	UAS Systems Management	UAS Data Processing
UAS Certification					UAS Data Visualization
					UAS Data Presentation
					UAS Data Integration

# Governance Examples

## UAS Policies & Practices

### UAS Policies

### UAS Compliance

### UAS Certification

- General Operations Manual
- SMS Manual
- Contractor Compliance Manual
- UAS Vendor Policies & Procedures Manual
- Emergency Response Procedures Manual (ERP)
- UAS I.T. Manual – In Development

Developed from Manned Aviation Part-135 templates and alignment with Manned flight department manuals. Continually updating and reassessing to ensure compliance and tailored as needed for specific operating areas via SOP.

### UAS VENDOR POLICY AND PROCEDURES MANUAL

This manual provides the minimum requirements for an unmanned aerial system ("UAS") or Remotely Piloted Aircraft Systems (RPAS) vendor or Drone-as-a-Service ("DaaS") performing work for Cargill. It includes minimum standards and procedures intended to promote the safe and efficient operation of the use of UAS / RPAS. This manual is NOT all encompassing and does NOT replace good and conservative judgment. Safety is the number one priority of Cargill and will be prioritized ahead of any other factors regardless of the nature of the mission.

Our expectation is that UAS will be safely utilized to conduct inspections, surveys and aerial photography to mention a few technology applications while respecting the privacy of others. To this end the Cargill will only use Unmanned Aerial Systems for approved operations outlined by the Cargill COE UAS.

# Starting Points & Considerations for Program Execution

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- **Review Historical use or present use of Drones in the organization.**
- **What Challenges or Problems are we trying to solve?**
- **Defined goals, forecast demand & timeline?**
- **UAS utilization requirements / needed data sets & reports?**
- **Perceived or Known ROI's with Business Case Analysis?**
- **Implementation Costs, Approach & Considerations?**
- **Where is the geographical site? (Applicable Limitations [Rules & Regulations])**
- **Does Technology exist on the market to support end goals?**
- **Change Management Considerations (Workflow, Data Management, Reduction of Staff, Etc.)**

# Example of a Charter of Exploration

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## Goals:

Find opportunities where drone technology can create quantitative & qualitative returns on investment for the organization.

## Methodology:

Work with specific internal teams or business units and complete the following:

- ☐ Provide education on drone technology, regulatory requirements and the organizations approach to managing, governing & implementing drone technology.
- ☐ Assess & review past utilization of drones in the business unit or function.
- ☐ Annotate opportunities where drone technology can benefit the business unit or function.
- ☐ Conduct financial analyst of using drone technology to create quantitative ROI's.
- ☐ Assess qualitative ROIs of using drone technology for areas of opportunity.
- ☐ Conduct one or more proof of concept test runs to evaluate & confirm ROI's.
- ☐ Regroup the team to review all data and make decisions on implanting drone tech in the BU or functional team and present to leadership.
- ☐ Agree on operating model, (Work ordered to the Drone Program team, conducted locally or regionally, or utilize a service supplier)?
- ☐ Establish a implementation plan or create a timeline for when to use of drone technology.
- ☐ Develop a formal report to catalog findings, experience and other data points for future use.

# Master list of ROI's

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## Qualitative:

1. Reduction of Hazardous work hours
2. Increased Situational Awareness
3. Development of Digital Libraries
4. Improved Decision Making
5. Refined Metrics for Analysis
6. Increase Competitiveness – Tech Adoption
7. Improve Customer / Consumer Experience
8. Process Improvement
9. Reliability Excellence

## Quantitative:

1. Cost Savings
2. Efficiency
3. New or Enhanced Revenue
4. Cost Avoidance
5. Warranty & Insurance Claim Processing
6. Capital Planning & Savings

# Example of Discovered Opportunities

1. **Inspection of Evaporators & Storage Tanks:**
  - Internal Inspections
  - External Inspections
  - NDT/NDI Thickness Testing
2. **Pier & Retention Levy / Berm Inspections**
3. **Solar Pond Surveys & Monitoring**
4. **Volume Metric Stockpile Surveys (Raw & Packaged)**
5. **Facility Inspections:**
  - Roof Inspections
  - General Condition Inspections
  - Road & infrastructure Inspections
6. **Asset Tracking & Counting**
7. **Underground Mine Surveys & Mapping**
8. **Rail Car Internal / External Tank Inspections**
9. **Environmental Survey & Monitoring (Water, Vegetation, Animals, Etc)**
10. **Damage Assessments**



# Organizational ROI Examples

## Increasing Safety Margins

- Minimize Work at Heights
- Reduce Confined Space Entry's
- Reduce risk exposure for security staff – Not requiring them to walk in areas with venomous or aggressive animals
- Minimize Having employees in boats on rivers for flood mitigation / measurements

## Cost Savings

- Estimated Cost Savings at one facility to be \$2,400 per month
- Reeducation of two staff members by augmenting drones
- \$4K-\$37K saved by not hiring a crane or bucket truck to complete inspections
- Engineers and Managers are not traveling onsite since reports are inclusive and actionable (Saved travel expenses)

## Improve Efficiency

- Reduced Inspection Duration and Setup
- Reduced Reliance on Specialized Equipment or need to shut down operations for long periods
- Logistical Planning is reduced and increased video / imagery from multiple angles
- Ability to collect large datasets in a short period of time rapidly versus ground based sensors

## Better Decision Making & Image Products

- Formal End products / reports are being built quickly for review and action
- Ability to reach difficult areas and provide pin point accuracy for repairs
- Increased awareness for asset visibility and life cycle management
- Creating catalogs of data for year over year analysis

# Rough Business Analysis

## Implementation Costs & Considerations:

### Hardware & Software:

1. ELIOS 2 Drone Kit: \$37,000
2. Mavic 2 Enterprise Drone Kit: \$2,400
3. Pix4D Software: \$12,000 a Year
4. UAS Training & Certification: ~\$3,200 Per Student

Total Cost for Supplier Execution: ~ **\$25K-\$45K (2 to 4 Days)**

Total Cost for Equipment and Training of 2 students: ~ **\$58K**



## Estimated or Known ROI's:

- Reduction of Hazardous Work Hours
- Reduction in Inspection Costs (Scaffolding / Contractors)
- Ability to inspect equipment while running
- Development of Digital Asset Inspection Libraries
- Maintenance Planning Data ahead of Shutdowns
- EPA Compliance Inspection execution
- Increased situational awareness with: Damage Surveys / Monitoring Surveys
- Control & Ownership of all Captured Data

Typical cost of scaffolding: \$20K Plus

Typical days to conduct legacy inspections: 3-5 Days



# Final Thoughts

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1. Drones are in a highly regulated environment from CAA's, Federal, State and Local Entities. These laws and rules are constantly evolving. Frequently monitor, evaluate prior to new projects and plan accordingly.
2. Lean on your internal functional teams and SME's in supporting development and refinement of your drone program.
3. Cyber Security of Drone Technology must be managed and paired appropriately for data capture classification.
4. Hardware & Software manufactures continue to flux with decreasing and increasing options. Plan accordingly.
5. Demonstrate ROI's and a sustainable approach for Senior leadership's buy-in.
6. Track and maintain all Metrics for your drone program and find solid data management solutions.
7. Always conduct safe operations and follow aviation SMS principals.
8. Lean on industry colleagues, manufactures and service providers to validate and improve your program....Were all still in the "R&D" phase in someway and could use feedback or ideas to stimulate improvement.
9. Tackle low-hanging fruit first, then tackle complex projects (Night Inspections, BLOS, New Applications)
10. Help the Drone industry by providing factual data, share success stories and be involved with your CAA to promote fair and balanced regulations that support growth and safety.



Helping the world *thrive*