UTILIZING DRONES FOR SAFETY: *ENHANCING SAFETY AND SECURITY THROUGH AERIAL TECHNOLOGY*

NEW ENGLAND SAFETY ROUNDTABLE

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INTRODUCTION

- This presentation will provide a brief overview into the use of drones, UAS (unmanned aerial systems), and UAV (unmanned aerial vehicles), specifically as it relates to enhancing your safety operation

INTRODUCTION – ORIGIN OF DRONES

- The use of commercial drones began in the early 1980's when Israel pioneered the development and deployment of unmanned aerial vehicles (UAV's) for military and commercial purposes. The modern era of commercial drones really began around 2006 with the introduction of the first commercially successful consumer drone, the Parrot AR Drone which was released in 2010.

INTRODUCTION – ORIGIN OF DRONES

Drones have become far more sophisticated and have been used in widespread safety applications, across a variety of industries.

The use of drones to enhance safety environments has saved lives and reduced dangerous exposures for employees.

WHAT IS THE DEFINITION OF A DRONE?

- Drones come in all shapes and sizes from very large military drones weighing thousands of pounds to commercial drones from .5-pound racing drone up to 55 pounds.

They can be fixed-wing, rotor, or multi-rotor. It's important to note that the FAA, and most organizations, classify drones into one of two major categories: Unmanned Aerial Systems (UAS) are the most commonly used drone type commercially. It is obviously unmanned, but what makes it a "system" is that it includes the drone itself and the pilot and, if required, an observer. These drones require a pilot to operate the drone and are not flown autonomously.

The other major category is an Unmanned Aerial Vehicle (UAV). These drones, most often used by the military or large commercial operators, can be flown independently solely using GPS, AI, or with preprogrammed internal guidance systems to fly a specific pattern, track or path and/or conduct applications and operations.

DRONE COMPONENTS AND CAPABILITIES

- Frame: The frame is the physical structure of the drone that holds all the components together. It is typically made of lightweight materials such as carbon fiber, plastic, or lightweight metal.
- Motors: Drones are equipped with electric motors that power the propellers and provide the necessary thrust for flight. The number of motors can vary depending on the drone's design, but most multirotor drones have four or more motors.
- Propellers: Propellers are attached to the motors and are responsible for generating lift and propulsion by pushing air downwards.
- Electronic Speed Controllers (ESC's): ESC's are electronic circuits that control the speed of the motors by regulating the power supply from the drone's battery.

DRONE COMPONENTS AND CAPABILITIES

- Flight Controller: The flight controller is a crucial component that serves as the "brain" of the drone. It contains sensors (such as gyroscopes and accelerometers) that detect the drone's orientation in space, detect movement, as well as a microcontroller that processes this data and sends commands to the motors to stabilize the drone and control its flight.
- Battery: Drones are powered by rechargeable lithium polymer (LiPo) or lithium-ion batteries, which provide the necessary electrical energy to the motors and other electronic components.
- Remote Controller/Transmitter: This is the handheld device used by the pilot to send command to the drone, controlling its movement, altitude, and other functions. In some cases, drones may also be controlled via a smartphone or tablet using a dedicated app.
- Onboard Sensors: Depending on the type and sophistication of the drone, additional sensors such as GPS, altimeters, compasses, cameras (still and video), specific task related sensors (thermal, FLIR, etc.) may be included to enable features like autonomous flight, navigation, obstacle avoidance, and aerial photography.

DRONE COMPONENTS AND CAPABILITIES

- Communication System: Drones may incorporate wireless communication systems, such as Wi-Fi, radio frequency (RF), or Bluetooth, to transmit data and receive commands from the operator or other control systems.
- Payload: Depending on the drone's intended use, it may carry additional equipment or payloads, such as cameras, sensors, weapons systems, or even packages for Amazon Prime delivery!

LICENSING REQUIREMENTS – FAA PART 107

- Since August of 2016, the FAA requires all that operators of commercial drones pass and maintain a Part 107 UAS Pilots License. Part 107 refers to the Statute written into law and establishes requirements for commercial drone operations. Each person operating the drone must pass a Federal Part 107 UAS Pilots test that covers regulations, airspace, weather, loading and performance, and operations.

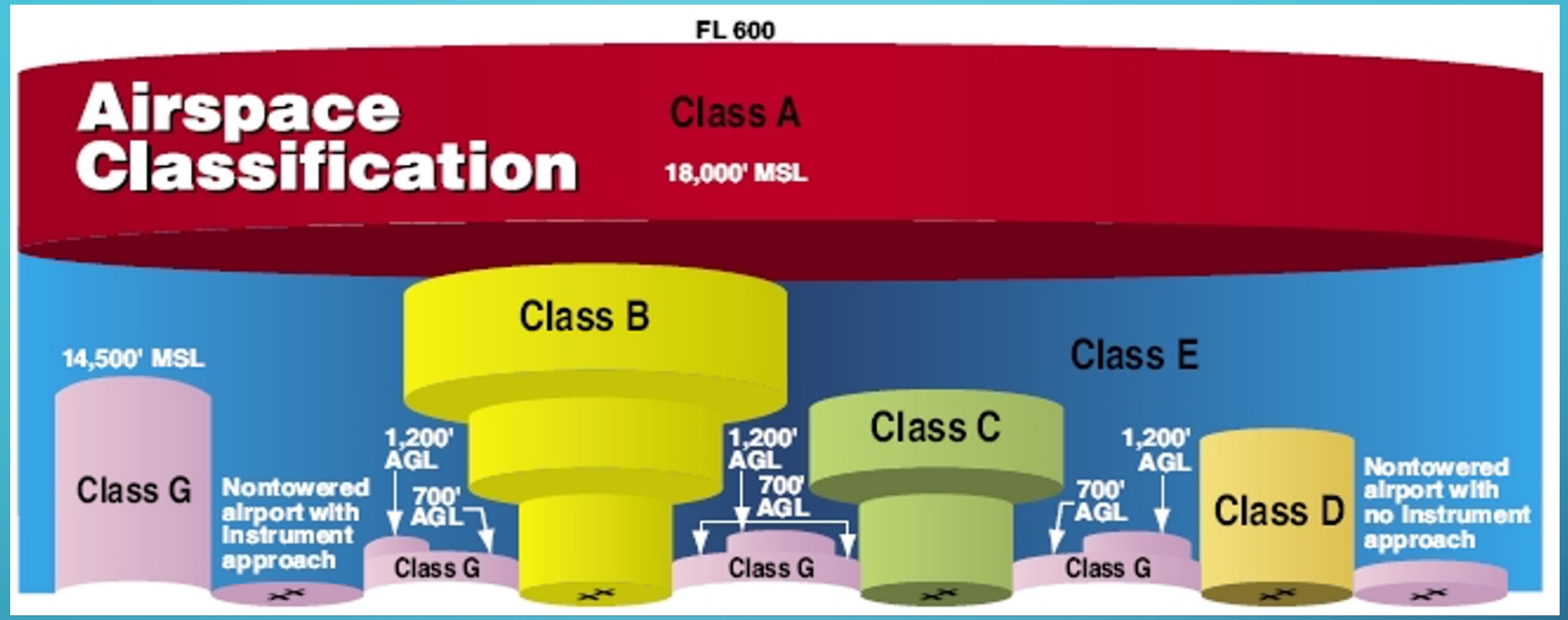
PART 107 LICENSING REQUIREMENTS – TESTING KNOWLEDGE

- Knowledge required to pass the FAA test:
  - Applicable regulations relating to small unmanned aircraft system rating privileges, limitations, and flight operation
  - Airspace classification and operating requirements, and flight restrictions affecting small unmanned aircraft operation
  - Aviation weather sources and effects of weather on small unmanned aircraft performance
  - Small unmanned aircraft loading and performance

PART 107 LICENSING REQUIREMENTS – SPECIFIC KNOWLEDGE

- Emergency procedures
- Crew resource management
- Radio communication procedures
- Determining the performance of small unmanned aircraft
- Physiological effects of drugs and alcohol
- Aeronautical decision-making and judgment
- Airport operations
- Maintenance and preflight inspection procedures

Part 107 Airspace Requirements



- Operations in Class G without ATC authorization
- Operations in Class B, C, D & Class E surface areas require ATC authorization
- Phased approach to airspace authorizations
- Online portal available at https://www.faa.gov/uas/request_waiver/

OTHER LICENSING REQUIREMENTS –

- Be at least 16 years old
- Be able to read, speak, write, and understand English
- Undergo a Transportation Security Administration (TSA) security screening

APPLICATIONS OF DRONE USE IN SAFETY

- Drones have been used over the last 15-years or so to enhance safety. Actually, much more so in the past few years as technology advancements in weight, sensors, and battery longevity have improved.
- Drones are currently being used for inspections of all types, air quality measurements in hazardous environments, confined space assessments, ecological uses such as pipeline inspections and water intrusion identification, and literally a thousand other uses only limited by creativity and money

DRONE USE IN INDUSTRY

There are a variety of industries currently using drone technology such as:

- Electric Utilities (electric transmission, distribution, substation, wind turbine generators, solar panel inspections, underground vaults, etc.),
- Gas and Oil pipeline inspections
- Federal, State and Local Governments for air quality emission monitoring (no longer having to climb a smokestack to get air samples),
- Local and National Search and Rescue operations that cover in an hour what would take a day or more in rugged terrain saving valuable rescue time and the lives of both the rescued and rescuer.
- Emergency Management to survey flood damage or the aftermath of a natural disaster such as a hurricane, tornado, or earthquake.

SEARCH AND RESCUE OPERATIONS

- Aerial Reconnaissance: Drones equipped with cameras and other sensors can provide aerial views of the search area, helping rescuers identify hazards, locate missing persons, or assess the extent of a disaster or emergency situations.
- Thermal Imaging: Drones equipped with thermal cameras can detect body heat, making it easier to locate individuals, especially at night or in situations where visibility is limited.
- Communication Relay: Drones can be used to establish communication networks in areas where infrastructure has been damaged or is non-existent, helping rescuers coordinate their efforts more effectively.
- Delivering Supplies: Drones can transport essential survival supplies such as food, water, medicine, or communications devices to people in need, especially in areas that are difficult to access by traditional means.

SEARCH AND RESCUE OPERATIONS

- Mapping and Surveying: Drones can create high-resolution maps and 3D models of the search area, which can aid in the planning and coordinating search and rescue operations.
- Rapid Deployment: Drones can be quickly deployed and can cover exceptionally large areas in a relatively short amount of time, increasing the efficiency of the search and rescue operations and, in turn, saving lives.

SURVEILLANCE AND MONITORING

Drones are increasingly being used for surveillance and monitoring due to their versatility and ability to access hard-to-reach areas. Here are some common ways drones are used in surveillance and monitoring:

- *Law Enforcement and Boarder Control*
- *Wildlife Monitoring*
- *Disaster Response*
- *Infrastructure Inspections*
- *Environmental Monitoring*

SURVEILLANCE AND MONITORING

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- *Event Security*
- *Agricultural Monitoring*
- *Traffic Monitoring*

ENVIRONMENTAL AND INDUSTRIAL SAFETY INSPECTIONS – CONFINED SPACE

Drones are being increasingly used to assess confined spaces for a variety of purposes, including inspection, surveillance, and maintenance. Confined spaces such as industrial tanks, storage vessels, pipelines, and tunnels present unique challenges for inspection and assessment due to restricted access, safety concerns, and often hazardous environments. Drones offer several advantages for assessing confined spaces:

- *Remote Access*
- *Visual Inspections*

ENVIRONMENTAL AND INDUSTRIAL SAFETY INSPECTIONS – CONFINED SPACE

- *Mobility and Maneuverability*
- *Safety*
- *Data Collection and Analysis*
- *Cost Efficiency*

INFRASTRUCTURE SAFETY

Drones are being increasingly used by various industries for inspection purposes due to their ability to access hard-to-reach areas, collect high-resolution data, and improve safety and efficiency. Here are some ways drones are being used for inspection in various industries:

- *Infrastructure Inspection*
- *Utility Inspection*
- *Construction Site Inspection*

INFRASTRUCTURE SAFETY

- *Oil and Gas Industry*
- *Agriculture*
- *Environmental Monitoring*
- *Insurance Inspections*

DRONES IN FIREFIGHTING AND HAZARDOUS MATERIAL HANDLING

Drones are being increasingly utilized in firefighting and hazardous material handling for their ability to access remote or dangerous areas, gather real-time data, and assist in decision-making. Here are some ways drones are being used in these scenarios:

DRONES IN FIREFIGHTING AND HAZARDOUS MATERIAL HANDLING

- *Aerial Reconnaissance*
- *Fire Mapping*
- *Monitoring and Surveillance*
- *Hazardous Material Detection*
- *Delivery of Supplies*
- *Communication Relay*

REGULATORY CONSIDERATIONS

Overview of FAA Regulations, Restrictions, and Guidelines for the Safe Operation Of Drones (Without Waivers):

- *Visual line-of-sight only*
- *Daylight or civil twilight only*
- *No operations over people*
- *Must yield right-of-way to manned aircraft*
- *One UAS per operator*
- *Max groundspeed of 100 mph*
- *External load operation*
  only permitted if the load does not affect flight operations or control

REGULATORY CONSIDERATIONS

Overview of FAA Regulations, Restrictions, and Guidelines for the Safe Operation Of Drones (Without Waivers):

- The FAA has the authority to manage airspace and civil aircraft operations
  - 49 U.S.C. §40103(a)(1)
- An aircraft is any device used, or intended to be used, for flight
  - 49 U.S.C. §40102(a)(6)
- UAS are aircraft and must comply with FAA regulations.

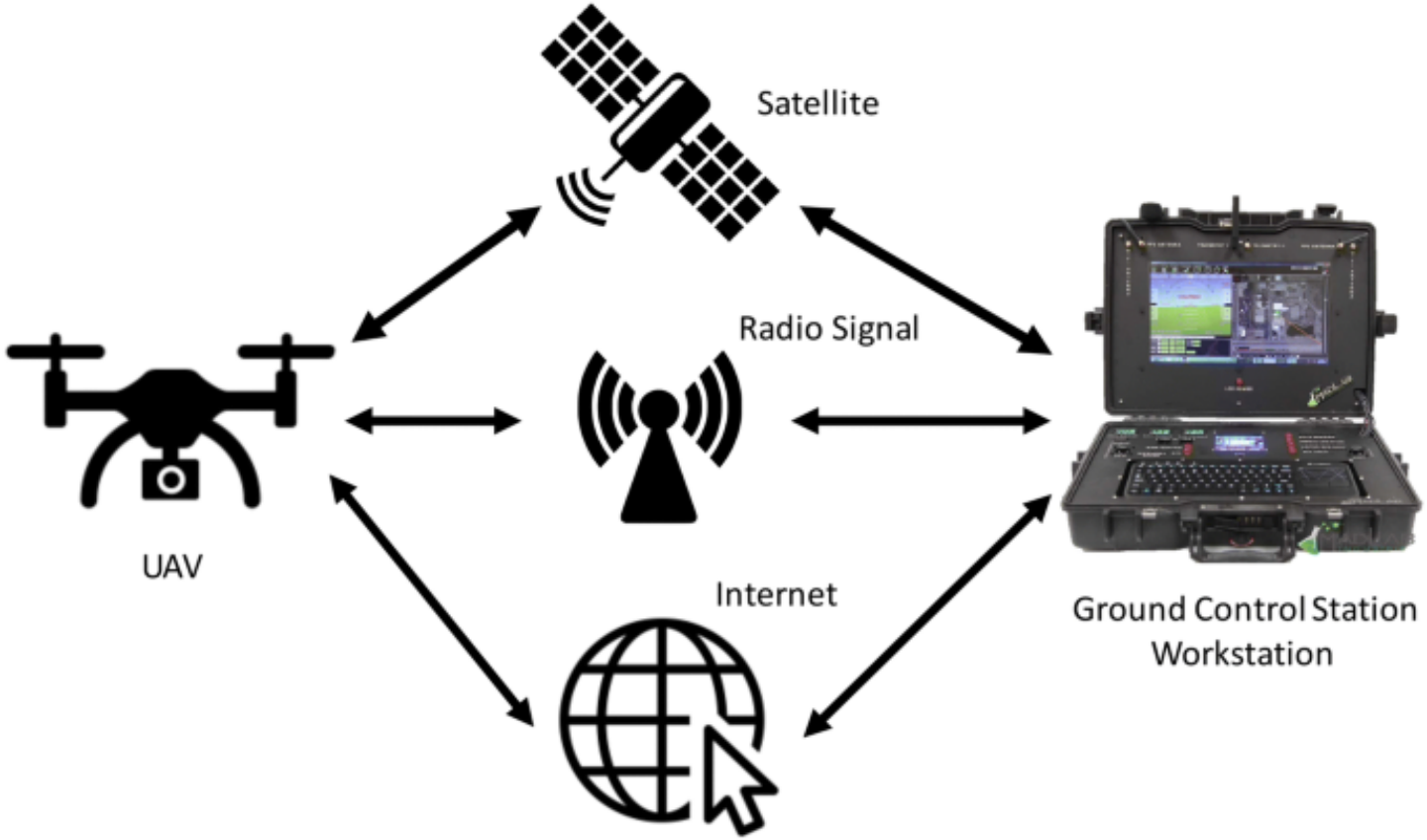
TECHNOLOGICAL ADVANCEMENTS

The drone industry has been experiencing rapid technological advancements, and several trends were expected to shape its future. While I don't know all the latest developments, some of the anticipated advancements in the drone industry include:

- *Improved Battery Life*
- *Enhanced Automation and AI*
- *Advanced Sensors and Payloads*
- *Urban Air Mobility (UAM)*

TECHNOLOGICAL ADVANCEMENTS

- *Regulatory Framework*
- *Connectivity and Communication*
- *Security and Counter-Drone Technology*



REAL WORLD CASE STUDIES:

Here are a few specific examples where drones have been credited with saving workers' lives:

- Mining Industry: In 2017, a drone operated by an Australian mining company, South32, located a worker who had been reported missing after an accident at the company's Worsley Alumina mine. The drone was equipped with thermal imaging technology, which allowed it to locate the worker in dense vegetation, enabling a successful rescue operation.
- Construction Site: In 2022, a construction worker in North Carolina, USA, fell from a roof and was severely injured. Emergency responders used a drone equipped with a thermal camera to locate the worker in a densely wooded area, allowing them to swiftly provide medical assistance and transport the worker to a hospital.

REAL WORLD CASE STUDIES:

Here are a few specific examples where drones have been credited with saving workers' lives:

- Offshore Oil Rig: In 2021, an offshore oil rig worker in the Gulf of Mexico suffered a serious hand injury. The US Coast Guard used a drone to deliver a tourniquet and medical supplies to the rig, enabling the injured worker to receive immediate medical treatment.

OPERATIONAL START-UP COSTS

The startup cost for a drone program can vary significantly depending on the industry, the scale of operations, the type of drones used, and the specific requirements of the program.

- *Initial Drone Cost – X2 (one much less expensive practice drone that WILL crash)*
- *Training and Certification*
- *Maintenance and Repairs*
- *Insurance*
- *Regulatory Compliance*
- *Software and Data Management Programs*

OPERATIONAL START-UP COSTS

- *Communication and Safety Equipment*
- *Operational Costs*
- *Scalability and Expansion*
- *Contingency Fund*

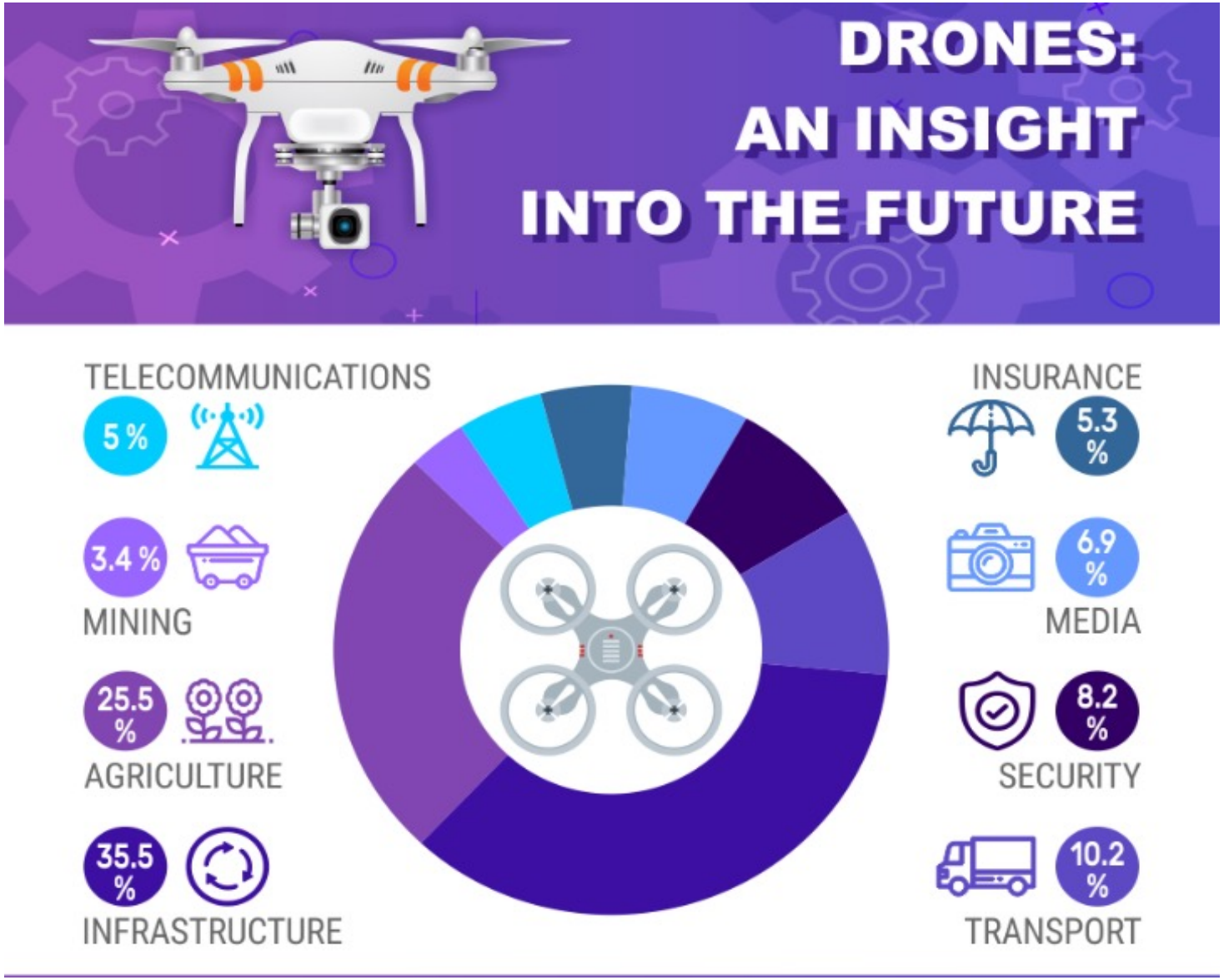
By carefully considering these factors, organizations can establish a comprehensive budget for a new drone program that covers all necessary expenses and sets the program up for success.

CONCLUSION – SUMMARY OF KEY POINTS

Drones can be an exceptionally cost-effective tool that often gets the job done much more quickly without placing our employees in harm's way.

The use of drones in your type of business is limited only by your imagination.

As prices come down, and drone capabilities continue to expand, they will play an ever-growing role in the safety environment.



QUESTIONS?