

Drones in Real Estate

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ABSTRACT

The adoption of drones has changed the way real estate is marketed, evaluated, developed, and managed. A drone can capture viewpoints and spatial information that are difficult, expensive, or unsafe to obtain from the ground. In real estate, this capability is useful not only for attractive photographs but also for practical tasks such as roof assessment, site analysis, documentation, and construction planning. Today, drones equipped with high-definition cameras can effortlessly capture sweeping aerial photographs and cinematic video tours. These dynamic visuals allow potential buyers to see the full scope of a property, including its layout, landscaping, and proximity to neighboring amenities such as parks, schools, or bodies of water. When used responsibly, drones help professionals make properties easier to understand for buyers, investors, tenants, inspectors, and developers. This paper explores how drone technology can elevate your real estate marketing efforts.

KEYWORDS: *drones, unmanned aircrafts, unmanned aerial vehicles (UAVs), unmanned aircraft systems (UAS), real estate, realtor, property.*

INTRODUCTION

The real estate industry, traditionally rooted in physical presence and static imagery, has undergone a profound transformation in recent years. At the forefront of this evolution is the integration of Unmanned Aerial Vehicles (UAVs), commonly known as drones. These high-flying devices have shifted from being novelty gadgets or military tools to becoming indispensable assets in the property market. What began as a novel tool for capturing sweeping aerial shots of luxury properties has rapidly evolved into a multifaceted asset reshaping property marketing, inspection, and development. Real estate agents and marketing agencies can now afford to include aerial shots in listings for mid-range and even entry-level homes, democratizing a marketing technique that was once exclusive to high-end properties [1].

WHAT IS A DRONE?

At least three terms are used to describe drones, depending on how they are operated. The terms include Unmanned Aerial Vehicles (UAVs), Unpiloted Aircraft System (UAS), and Remote Piloted Aircraft System (RPAS). The FAA defines

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drones, also known as unmanned aerial vehicles (UAVs), as any aircraft system without a flight crew onboard. Drones include flying, floating, and other devices, including unmanned aerial vehicles (UAVs), that can fly independently along set routes using an onboard computer or follow commands transmitted remotely by a pilot on the ground. A typical drone is shown in Figure 1 [2]. A drone is usually controlled remotely by a human pilot on the ground, as typically shown in Figure 2 [3]. Drones can range in size from large military drones to smaller drones. Drones, previously used for military purposes, have started to be used for civilian purposes since the 2000s. Since then, drones have continued to be used in intelligence, aerial surveillance, search and rescue, reconnaissance, and offensive missions as part of the military Internet of things (IoT). Today, drones are used for different purposes such as aerial photography, surveillance, agriculture, entertainment, healthcare, transportation, law enforcement, etc.

Drones work much like other modes of air transportation, such as helicopters and airplanes. When the engine is turned on, it starts up, and the

propellers rotate to enable flight. The motors spin the propellers and the propellers push against the air molecules downward, which pulls the drone upwards. Once the drone is flying, it is able to move forward, back, left, and right by spinning each of the propellers at a different speed. Then, the pilot uses the remote control to direct its flight from the ground [4],

Drone laws exist to ensure a high level of safety in the skies, especially near sensitive areas like airports. They also aim to address privacy concerns that arise when camera drones fly in residential areas. These include the requirement to keep your drone within sight at all times when airborne. In the United States, drones weighing less than 250g are exempt from registration with civil aviation authorities. If your drone exceeds 250g in weight, you will also require a Flyer ID, which requires passing a test [5]. It is necessary to register as an operator, be trained as a pilot, and have civil liability insurance, in addition to complying with various flight regulations, and those of the places where their use is permitted.

Most drones have a limited payload, usually under 11 pounds. Drones are classified according to their size. Here are the different drone types:

- Nano Drone: 80-100 mm
- Micro Drone: 100-150 mm
- Small Drone: 150-250 mm
- Medium Drone: 250-400 mm
- Large Drone: 400+ mm

One of the emerging trends in drone use for factories is the utilization of LiDAR technology. LiDAR stands for Light Detection and Ranging. This technology provides accurate depth information essential for understanding the three-dimensional structure of the environment. LiDAR sensors emit laser beams to measure distances to objects, creating high-resolution 3D maps of the surrounding terrain and objects. The ability to capture detailed data through LiDAR technology has opened up opportunities for better predictive maintenance, reduction in inspection times, and overall cost savings [6].

DRONES IN REAL ESTATE

The real estate industry has always been driven by visual appeal and the ability to showcase a property's true potential. For decades, agents relied on traditional photography, written descriptions, and physical walkthroughs to attract buyers. However, the advent of unmanned aerial vehicles, commonly known as drones, has fundamentally transformed the way properties are marketed, inspected, and sold. By providing unique perspectives, cost-effective solutions, and enhanced safety, drones have become an indispensable tool in modern real estate. One of the most significant benefits of drones in real estate is

their ability to capture high-quality, compelling visual marketing materials. Drone-enabled real-estate work uses small unmanned aircraft to collect aerial visual and geospatial information for decisions about a property's sale, condition, development, or management [1]. Figure 3 shows a representation of drones in real estate [7].

APPLICATIONS OF DRONES IN REAL ESTATE

Drones are set to play a pivotal role in the early stages of real estate development and urban planning. Common applications of drones in real estate include the following [1]:

- *Property Marketing:* The most familiar use of drones in real estate is aerial marketing. Drones have changed the way real estate is marketed. Conventional listing photographs can show rooms, finishes, and curb appeal, but they may not adequately communicate the relationship between a building and its surroundings. Drones have shattered this limitation by providing sweeping aerial views that were once only achievable through expensive helicopter rentals. With high-definition cameras and stabilization technology, drones can capture dynamic videos and stunning photographs that showcase not just the property itself, but its relationship to the surrounding environment. For luxury estates, sprawling ranches, or commercial developments, an aerial perspective highlights the true scale of the land, proximity to amenities like lakes or parks, and the layout of the neighborhood. This comprehensive visual narrative helps potential buyers form a deeper emotional connection with the property before they even step foot on the premises. The National Association of Realtors (NAR) explains that aerial imagery can highlight a home's landscape, outdoor features, and location, while giving prospective buyers views of the roof, yard, neighborhood, and surroundings that static ground-level photographs may not provide.
- *Inspections and Appraisals:* Beyond marketing, drones offer substantial practical benefits in property inspections and appraisals. Assessing the condition of a roof, chimney, or large commercial structure has traditionally been a time-consuming and sometimes dangerous task, requiring ladders, scaffolding, and significant physical effort. Drones mitigate these risks entirely. Equipped with high-resolution sensors and even thermal imaging cameras, drones can conduct thorough structural inspections in a fraction of the time. This efficiency not only reduces the costs

associated with traditional inspections but also accelerates the appraisal and closing processes, benefiting both buyers and sellers. Figure 4 shows the use of drones in real state inspection [8].

- **Asset Management:** After a property is sold or built, drones can support ongoing asset management. Repeated flights over a property can create time-stamped visual records of roofs, parking areas, landscaping, façades, construction work, or storm damage. Property managers may use those records to identify maintenance concerns early, document contractor work, and establish a baseline condition for future comparison. For owners of large portfolios, a consistent aerial record can also make remote oversight more practical. Insurance and risk-management functions are closely connected to this use.
- **Aerial Photographs:** Real estate listings with aerial images are 68% more likely to sell than those without. Adding aerial imagery to your marketing sets your listings apart and attracts more buyers. Drones give you the power to capture an all-encompassing aerial view of properties, showing the home and its surroundings at the same time. Aerial photographs and video can show a property's roofline, lot size, landscaping, access roads, surrounding amenities, and views in ways that ground-level images cannot. Aerial images can be persuasive because they allow agents to emphasize scenery, proximity to parks, large yards, or neighborhood context. Yet the same technology that makes a listing more visually compelling also creates significant practical and ethical challenges. For real estate professionals, drones are not simply cameras in the sky; they are aircraft operating in a regulated public space. Effective use therefore requires careful attention to aviation rules, privacy, safety, cost, reliability, and the truthfulness of marketing materials. Figure 5 provides some tips for effective real estate drone photography [9], while Figure 6 provides a typical aerial view [3].
- **Drone Videography:** Drone technology has revolutionized how properties are showcased, providing stunning aerial perspectives that captivate potential buyers. Drone videography is revolutionizing real estate marketing. From sprawling estates to commercial complexes, drones highlight property features and their surroundings in a unique and visually compelling way. Real estate professionals across the country are experiencing success through the use of drone

videography. A real estate developer utilized time-lapse drone videos to document the construction process. This innovative approach attracted investors and led to pre-sales of units before the project was completed. Figure 7 illustrates drone videography for real estate [10].

BENEFITS

Drones have undeniably elevated the real estate industry, offering a literal new perspective on property marketing and management. In addition to enhancing visual appeal, drones offer a highly cost-effective alternative to traditional aerial photography. The operational costs of a drone are a fraction of the price of chartering an aircraft. Other benefits of drones in real estate include the following [7,8,11]:

- **Estate Photography:** Drones are quickly becoming a valuable tool for real estate photography and videography. Drone real estate photography involves the use of unmanned aerial vehicles (UAVs) to capture high-quality images and videos of properties. This method provides a bird's-eye view of the property, showcasing the entirety of a plot, highlighting important features from the air, and showing how the home fits within the neighborhood. Real estate agents and brokers can use drones to capture aerial views of properties, which can be used in listings and marketing materials. Real estate professionals working with residential, commercial and land parcels can all benefit from the images and information obtained from using UAS technology.
- **Unique Perspectives:** Drone photography offers unique aerial perspectives that traditional ground-level photography cannot. It allows potential buyers to see the entire property, including the home, outbuildings, and land, providing a comprehensive view of the property.
- **Comprehensive Overview:** The unique perspectives offered by aerial photography provide a comprehensive view of properties, showcasing features that traditional ground-level photography may miss. Real estate professionals now routinely deploy drones to showcase properties from stunning aerial angles, inspect hard-to-reach areas, and provide comprehensive property overview. This aerial perspective helps buyers make more informed decisions and often creates emotional connections to properties through captivating visuals. Real estate drone services refer to using unmanned aerial vehicles (UAVs) to offer numerous services relating to the real estate market, such as capturing aerial images and videos of properties. Drones can be utilized

for remote monitoring, security, and maintenance during the construction process. They aid in cost-cutting, increasing efficiency, and streamlining processes.

- *Engaging Experiences:* Enhanced drone services and superior photography create engaging experiences, attracting buyers and driving sales in a competitive market. Through detailed 3D modeling and walkthroughs, potential buyers can explore properties comprehensively from the convenience of their own homes.
- *Cost-Effectiveness:* While the initial investment in high-quality equipment can be significant, drone photography can be a cost-effective way to produce high-quality images. The use of drones can reduce the need for expensive equipment like cranes or helicopters to capture aerial views.
- *Faster Turnaround Times:* A typical turnaround for a drone real estate photography project can be a few days to a week, from hiring a drone pilot, capturing the aerial photos, to editing and delivery. This is significantly faster than traditional methods, which can take weeks or even months.
- *Services Market:* The real estate drone services market includes revenues earned by entities through services such as videography, virtual tours, security and surveillance, environmental assessment, and land development planning. The market value includes the value of related goods sold by the service provider or included within the service offering. Only goods and services traded between entities or sold to end consumers are included.
- *Data Collection:* Beyond capturing impressive visuals, drones are increasingly used as sophisticated data collection tools in real estate. Equipped with specialized sensors, drones can gather information about properties that goes far beyond what the human eye can detect. The data collected by drones can be processed into detailed 3D models, topographical maps, or building information models (BIM) that provide unprecedented detail for property analysis.
- *Customer Service:* Exceptional customer service is crucial for building a successful drone real estate photography business. Be responsive, punctual, and professional in all your interactions. Go above and beyond to exceed client expectations.

Figure 8 shows some benefits of drones in real estate [9].

CHALLENGES

In spite of the immense potential, the widespread adoption of drones in real estate is not without challenges. Challenges include regulatory compliance, privacy concerns, safety risks, operating costs, weather-related limitations, and the potential for misleading presentation. Other challenges of drones in real estate include the following [1]:

- *High Costs:* Although consumer drones may appear inexpensive, professional results often require a reliable aircraft, extra batteries, a high-quality camera, editing software, maintenance, insurance, certification, and skilled labor. A successful aerial shoot can also require multiple visits because wind, rain, poor light, or airspace restrictions may make filming unsafe or impossible on the first attempt. For modest listings or lower-margin markets, the cost of professional drone services may outweigh the added marketing value. Depending on how often you plan to use real estate drone photography and video, it may be worth the initial financial investment and training to purchase your own drone.
- *Privacy Concerns:* Privacy concerns present a significant challenge. A drone filming one property may unintentionally record adjacent homes, residents, vehicles, children, or private outdoor spaces, raising legitimate privacy issues. The FAA explicitly notes that it does not regulate privacy, while local privacy laws may nevertheless apply to drone operations. Real estate professionals must be meticulous in their flight planning and transparent with neighbors to maintain ethical standards and avoid legal disputes. This division of responsibility makes compliance more complicated: an agent may satisfy federal aviation rules but still provoke a legitimate privacy complaint or violate a local restriction.
- *Regulatory Compliance:* This is a major challenge. In the United States, drone flights undertaken for real estate marketing are commercial rather than recreational activities. The Federal Aviation Administration (FAA) states that a person flying for purposes such as videography must hold a drone pilot certificate and comply with the Small UAS Rule. Commercial operators must also register drones flown under Part 107, display the registration number, maintain visual line of sight, observe applicable altitude limits, and obtain authorization before operating in controlled airspace near airports. In addition to federal Part 107

requirements, some states and towns have their own drone laws. These requirements can delay or prevent a planned photo shoot, especially in dense urban neighborhoods, near airports, or in areas subject to temporary flight restrictions. Navigating the complex airspace regulations set forth by aviation authorities requires specialized knowledge and certification. Agents who operate drones without the necessary credentials, or who hire unqualified operators, face potential legal and reputational consequences. Hiring a professional can be a smart move. A professional real estate drone pilot will have the proper certification, equipment and — most importantly — experience. Figure 9 shows what to look for in hiring a professional drone operator [9].

- **Liability:** Safety and liability form a major challenge. Drones can fall because of mechanical failure, depleted batteries, poor weather, navigation mistakes, or interference with communication signals. A crash near a home showing, a roadway, power lines, or a group of people can cause physical injury, property damage, or a severe disruption to a sale. The FAA requires pilots to avoid creating hazards to people or property and investigates reports of unsafe operations. In real estate, the risk is heightened because shoots frequently occur around houses, trees, pools, fences, construction sites, and prospective buyers.
- **Operational Considerations:** The advantages of drones do not remove the need for compliance and professional responsibility. In the United States, a drone flown for real-estate business purposes must be operated in accordance with FAA rules. Real-estate professionals must consider more than aviation rules. Flights should be planned with respect for neighbors' privacy and property rights, local restrictions, airspace limitations, weather, and safety risks to people on the ground. NAR similarly advises real-estate professionals to understand applicable local regulations and to use drones safely and responsibly.

FUTURE OF DRONES IN REAL ESTATE

The trajectory of drone technology in real estate points toward a future characterized by unprecedented efficiency, enhanced visual storytelling, and data-driven decision-making.

Looking ahead, the role of drones in real estate is poised for further expansion. As artificial intelligence and machine learning technologies advance, drones will become increasingly autonomous. As drone technology advances, characterized by enhanced

autonomy, superior imaging capabilities, and sophisticated data integration, its role in shaping the future of real estate transactions will undoubtedly grow, continuing to elevate the market to new heights.

The future of drones in real estate promises not only to elevate how properties are presented but also to revolutionize operational efficiency, property management, and urban planning. In the near future, the standard for property listings will shift from high-resolution static aerial photos to immersive, interactive experiences. This capability will allow prospective buyers to conduct virtual fly-throughs, exploring the property layout, neighborhood amenities, and proximity to key infrastructure from anywhere in the world. In the context of smart cities, drones will serve as mobile data nodes, continuously feeding real-time spatial information to urban planners, thereby facilitating more informed decisions regarding infrastructure development and land use [1].

CONCLUSION

Drones have expanded real estate professionals' ability to see, document, and explain a property. Their applications range from compelling aerial marketing to safer inspections, precise site mapping, construction monitoring, and long-term asset management. The integration of drones into the real estate industry represents a significant leap forward in property marketing and management. By providing breathtaking aerial visuals, reducing operational costs, ensuring safer property inspections, and enabling immersive 3D mapping, drones offer a substantial competitive advantage to real estate professionals. More information about the use of drones in real estate can be found in the books in [12-16].

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Figure 1 A typical drone [2].



Figure 2 A drone is usually controlled by operators on the ground [3].



Figure 3 A representation of drones in real estate [7].



Figure 4 Use of drones in real state inspection [8].



Figure 5 Some tips for effective real estate drone photography [9].



Figure 6 A typical aerial view [3].



Figure 7 Drone videography for real estate [10]



Figure 8 Some benefits of drones in real estate [9].



Figure 9 What to look for in hiring a professional drone operator [9].