Tools and Resources

Segregation of Airspace

There are two main categories of risk when operating drones:
Ground risk: Ground risks relate to the safety of people and infrastructure below
Air risk: Air risks mainly concern potential collisions between manned and unmanned aircraft, with a secondary focus on drones colliding with each other.

This document will focus on air risks. The key objective for air risk management is to prevent mid-air collisions between drones and manned aircraft, without stifling innovation.

> *“ The balance to be struck by regulators is ensuring safety while supporting the growth of unmanned aviation, an area with significant potential economic benefits which, depending on the country, could in the future outweigh the benefits currently provided by other users of the same airspace, such as crewed general aviation. ”*

There are two main strategies for avoiding collisions:

Active avoidance. Active avoidance involves operational adjustments, such as the re-routing of either unmanned or manned aircraft. This approach includes systems such as uncrewed aircraft traffic management (UTM) and detect-and-avoid technologies, but also visual observers.

Segregation: Segregation is based on the principle that aircraft that do not share the same airspace cannot collide - without requiring further technical or human measures. This can be implemented through measures such as area of operation notices, designated corridors, and specific flight levels

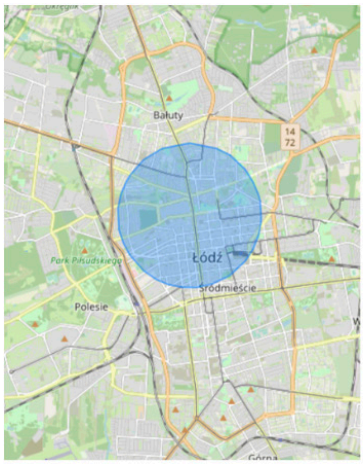
Segregation

Active Avoidance

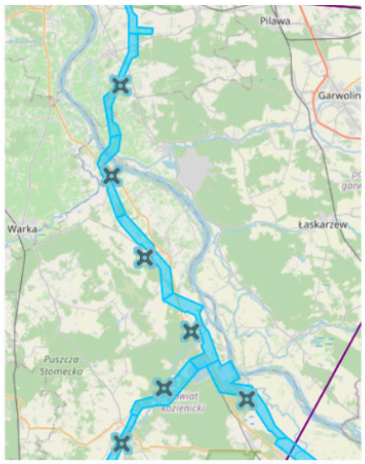
Regardless of the approach adopted, the target level of safety must remain consistent across all measures and must be consistent with the current level of safety of manned aviation. Ensuring this consistent level of safety is paramount, whether through separation, active avoidance or other methods.

For more on avoidance please visit the UTM section of the Wakanda Beyond Peer Action Group. In this primer we will provide a detailed overview on segregation of air space. Specifically we will discuss;

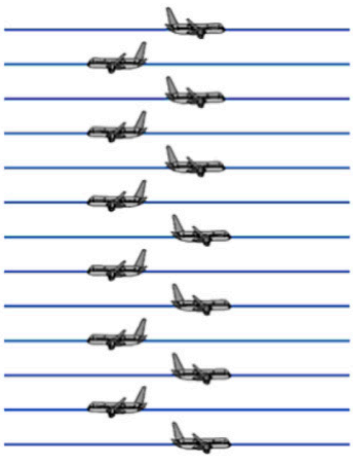
1. Area of operation notice



2. Drone Corridors



3. Vertical Separation



1. Area of Operation Notice

An Area of Operation Notice is a strategy used to provide information about drones operating within a specific, limited area defined by three-dimensional coordinates. This information can be disseminated through various channels such as apps, Notices to Airperson (NOTAMs) or UTM systems with interfaces to air traffic control, possibly in combination.

The information dissemination mechanism is critical to ensure that aircraft, including emergency services and military operations, are aware of drone activity in their potential operating area. This approach is easier to implement in regions where the entire airspace is managed, such as in Ghana. However, it requires that air traffic controllers are aware of drone operations and know to avoid them when routing traffic.

2. Drone Corridors

Corridors are particularly useful for logistics operations where drones have fixed routes rather than free-floating paths. They are defined paths, such as connecting lines between several hospitals and a laboratory, or from a central distribution warehouse to logistics end points, where drones are expected to operate frequently and at random intervals, but strictly within these defined boundaries.

These corridors act as three-dimensional tubes in the air within which drones must be expected. This structured approach helps to organise drone traffic and minimises the risk of collisions with manned aircraft, ensuring that drones remain within safe and predefined areas during their flights.

For corridors, the publication of notices to manned aircraft is crucial. This can be achieved through methods such as NOTAMs, UTM systems or a combination of measures. This strategy is particularly effective for long-term operations, as it allows time to ensure that all airspace users are aware of these drone corridors.

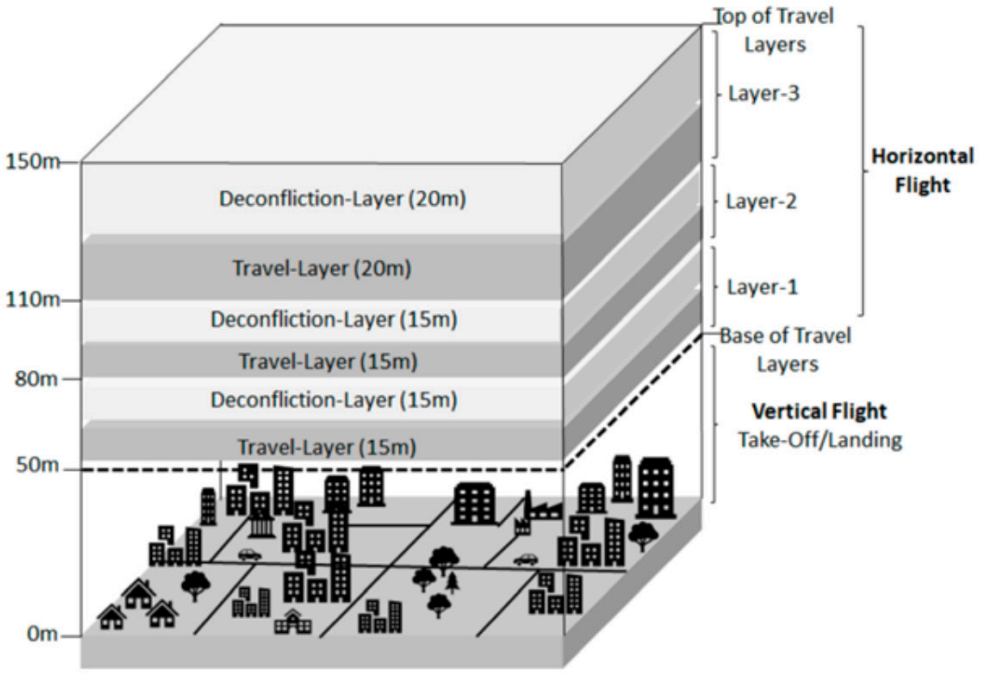
While the implementation of such corridors is easier in regions where the entire airspace is managed, it is not a prerequisite. In Poland, for example, corridors have been implemented without full airspace management. However, it remains essential that controllers are informed of these operations. Unlike AO notices, which typically apply to a specific, geographically limited area where it is necessary to conduct a drone operation, drone corridors are designed to connect endpoints. The specific path of these corridors can be strategically chosen to minimise disruption to manned air operations. This approach allows for a more dynamic integration of drones into the airspace, ensuring that their routes do not unsafely or significantly impact the flight paths of manned aircraft.

The establishment of these corridors also provides flexibility for helicopter pilots, allowing them to navigate above or below the designated drone operating tube, thus maintaining the safety and efficiency of airspace use.

3. Vertical Separation

Vertical separation, in principle a concept familiar from manned aviation, involves the assignment of specific altitude bands to different (types of) aircraft. In Class A airspace, for example, manned aircraft operate at specific flight levels given to them by air traffic controllers. This principle already applies to drones in many countries in a basic way: Drones are often allowed to fly close to structures, such as buildings, where manned aircraft are usually not allowed to fly.

By allocating different vertical slices of airspace to manned and unmanned aircraft, collisions can be avoided both strategically and tactically. For example, manned aircraft may not be allowed to operate below 300 feet unless they have announced aerial work via a NOTAM, while drones are free to operate below this altitude. This clear separation ensures that both manned and unmanned aircraft can coexist safely in the same airspace.



The implementation of vertical separation also contributes to safety in unmanaged airspace. However, special attention must be paid to take-off and landing procedures, for example, this approach cannot be applied near airports. This is particularly critical for emergency operations, including those involving helicopters, which may need to take place anywhere. Adequate planning and exemptions must be in place to address these situations and ensure that emergency services can operate unhindered.

Conclusion

In conclusion, the overall objective is to maintain the current level of aviation safety; the integration of unmanned aircraft should not compromise aviation safety. However, in countries where manned aviation activity is lower and the potential benefits of unmanned aircraft are significant, exploring innovative measures could be particularly beneficial. For example, allocating specific flight levels to drones could be a low-cost solution with a high safety impact, allowing the safe coexistence of manned and unmanned aircraft while taking advantage of the benefits of drone technology.

It is important to recognise that both manned and unmanned aircraft have legitimate rights to occupy airspace. Within Wakanda Beyond, there have been explorations of drone corridors and drone test zones. These areas are specifically designated for drones, preventing intrusion from manned aviation and providing safety through segregation.

Looking ahead, future solutions may allow non-segregated drone flights. However, the key challenge in such scenarios will be the active management of aviation risk, which can be complex and costly to implement for both authorities and operators. Ensuring the safety of both manned and unmanned aircraft will be critical as these new models of airspace integration are gradually developed and implemented.