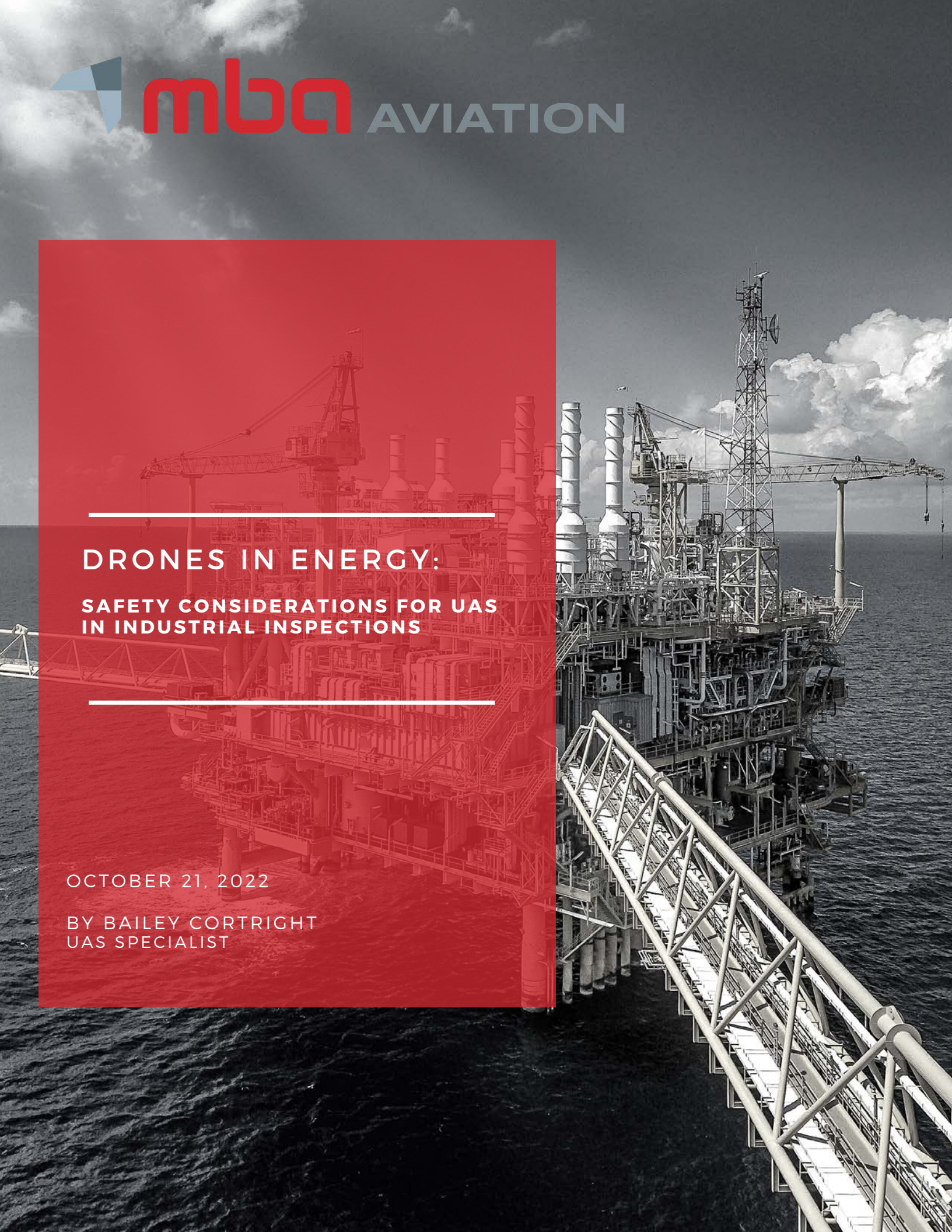

mba AVIATION

DRONES IN ENERGY:

SAFETY CONSIDERATIONS FOR UAS IN INDUSTRIAL INSPECTIONS

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Overview

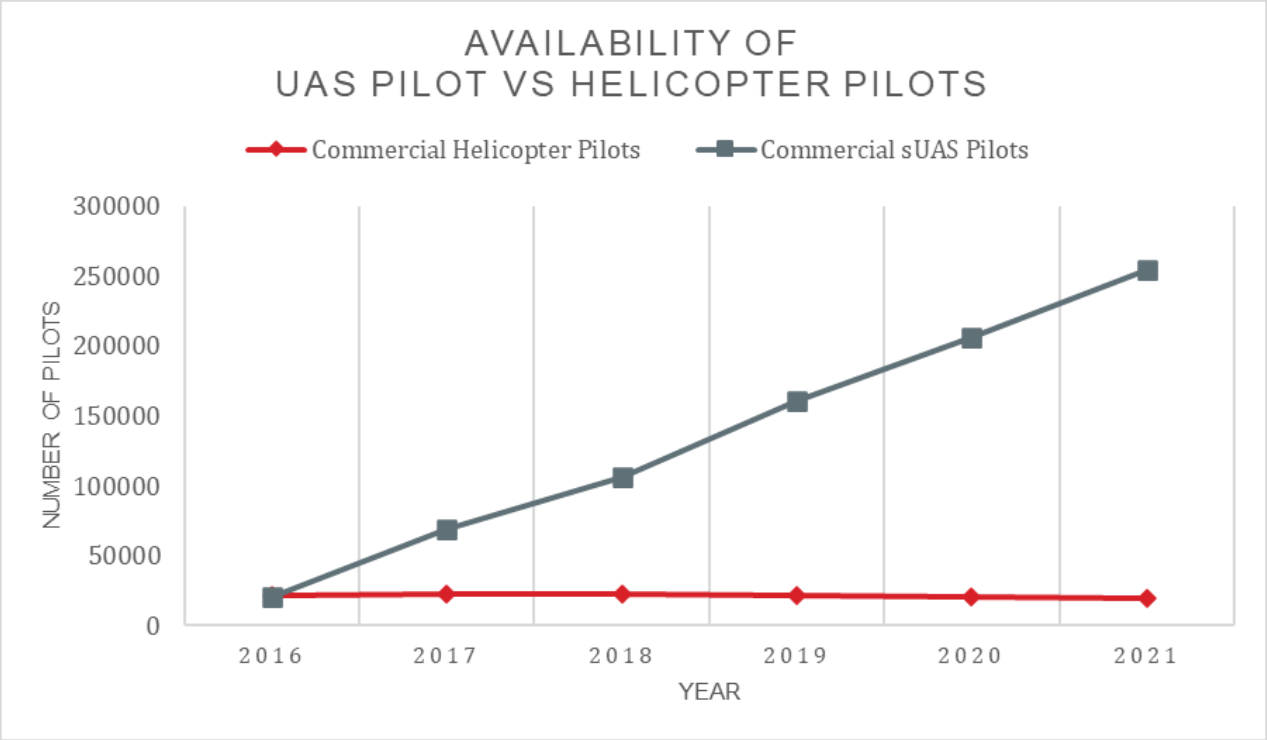
Energy and Utility Companies have traditionally utilized helicopters to conduct aerial inspections. Aerial inspections are commonly used on larger pieces of infrastructure such as bridges, powerlines, and wind turbines that would otherwise be impractical to inspect manually. They are vital to the maintenance of the infrastructure and help to maximize uptime and longevity.

Sophisticated imaging payloads gather high resolution data which is reviewed to identify maintenance concerns such as cracks, warping, and slackening of cables. These inspections are typically conducted at a low altitude, near the infrastructure, which can be hazardous. Small Unmanned Aircraft Systems (sUAS) have begun to successfully replace helicopters in the industrial aerial inspection market. The miniaturization of electronic components coupled with advanced flight software has allowed sUAS to perform inspections with increased accuracy and efficiency. Key enabling technologies include automated path planning, collision avoidance, and onboard processing.

Financial Considerations

From a cost perspective, the unit cost of an sUAS is considerably lower than a helicopter. In comparison, sUAS have reduced operating costs as personnel, fuel, maintenance, and insurance are all significantly reduced when utilizing sUAS. Comparatively, it is also much easier to employ a remote pilot than a helicopter pilot due to their market availability. Commercial remote pilots outnumber commercial helicopter pilots by over 12:1 [1].

[1] FAA U.S. Civil Airmen Statistics (https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics)



Safety Advantages

sUAS have major safety advantages in the operational environment compared to a helicopter. Flying a helicopter near energized power lines will always have significant aviation safety concerns, unfortunately, some of these factors are out of human control and cannot be mitigated. For example, at slower airspeeds and lower air densities, it is common for helicopters to experience vortex rings which can result in a loss of lift. When inspecting infrastructure so close to the ground there is not a lot of room for recovery, heightening the risk level for the mission.

For sUAS, many of these aviation safety concerns do not apply. sUAS are much better at hovering and flying slowly as they have multiple motors, allowing for quick adjustments to changing conditions. Additionally, onboard sUAS autopilots can make thousands of control inputs per second allowing for more stable and coordinated flight maneuvers. In the event of an emergency, it is much easier for a sUAS to land, especially in difficult terrain whereas a helicopter may not be able to make an effective emergency landing.

Due to better flight characteristics and higher risk tolerance, sUAS can inspect infrastructure from a shorter standoff range. Some sUAS also benefit from Simultaneous Localization and Mapping (SLAM), allowing the sUAS to autonomously adjust the inspection on the fly, based on real-time data. Whilst sUAS is the more efficient choice for Aerial Inspections, they are not an all-in-one solution for Energy and Utility companies. Certain maintenance tasks are still only capable of being completed by a technician that would need to be transported by a helicopter. For example, powerline cables need various types of maintenance such as spacer or marker ball installation which can only practically and reliably be installed by a human technician. The weight of these components alone precludes sUAS from this type of operation.

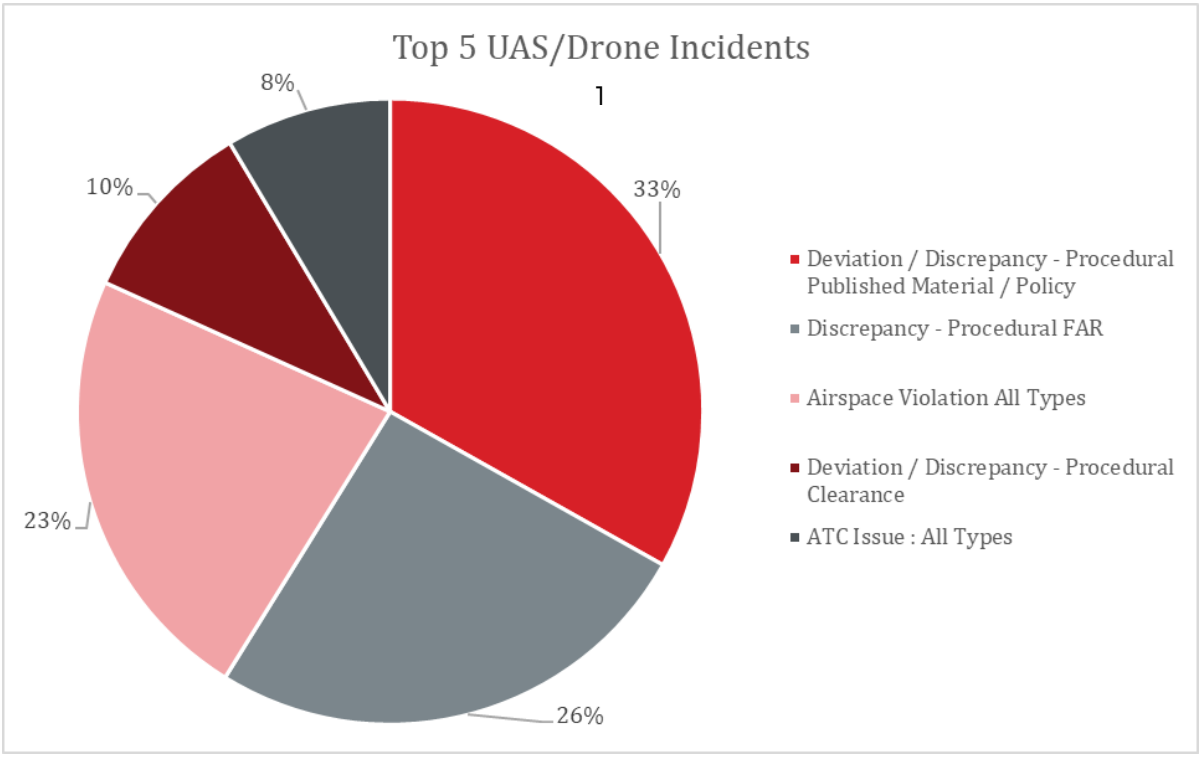
Improved Data Quality

In addition to financial and safety advantages, sUAS also provide more stable and consistent high-resolution data in comparison to a helicopter as it is less prone to vibrations, compared to a helicopter. Due to the reduced standoff range of an sUAS, they are also able to obtain finer ground sampling distances. This enables the sUAS to provide more detailed data that can identify maintenance issues that a helicopter may not have been able to detect. Additionally, sUAS can be more thorough in an inspection as they are able to access areas that were previously inaccessible to a helicopter, like the underside of a bridge, narrow areas etc. These advantages enables sUAS to make more critical finds compared to a helicopter.

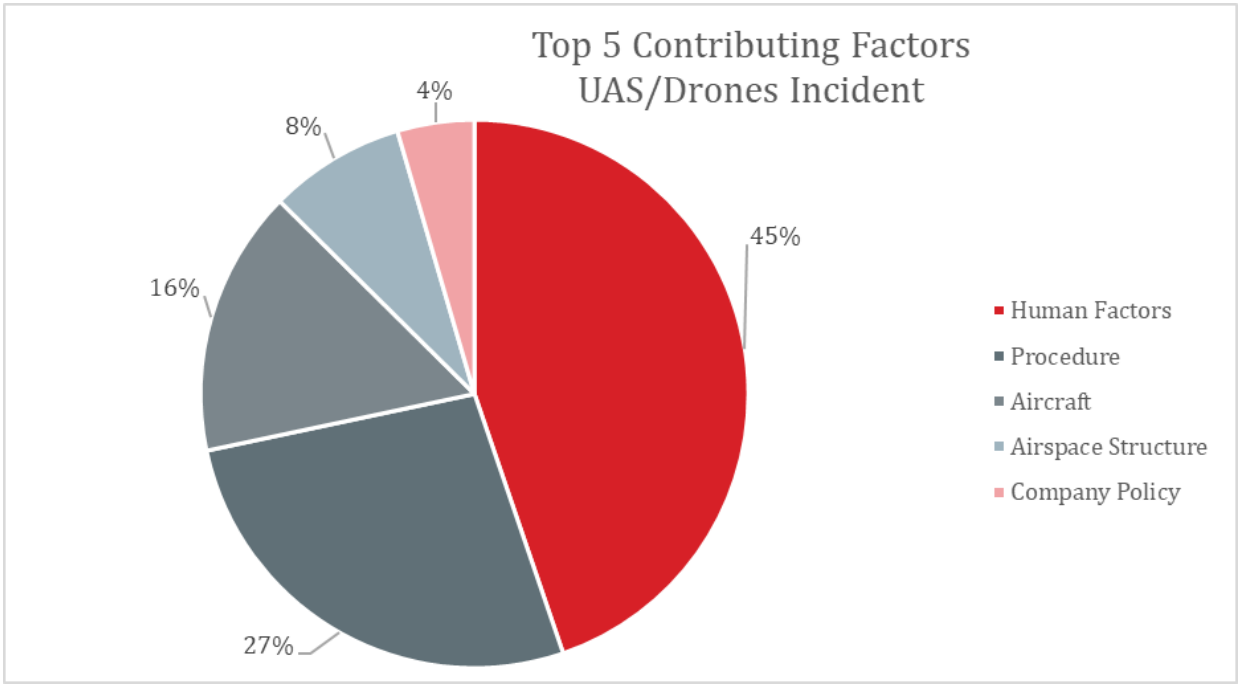
Operational Risks Concerning sUAS

sUAS are undoubtedly the future of aerial infrastructure inspections but they are not without their risks. Aviation safety assurance is key to any operation, as it ensures operational risks are mitigated, allowing for safer operations in the long term. From a safety perspective sUAS have many safety features built in, including, redundant electronics and automated contingency protocols like the return-to-home features.

Whilst this makes sUAS very reliable, with fewer failure points compared to traditional aircraft, they still have operational safety risks that exist due to its operational environment, nascent regulatory and procedural framework and errors caused due to Human Factors.



Despite commonly being referred to as "unmanned," sUAS still have humans behind the controls and/or monitoring the operation. Human factors are the largest primary problem for part 107 operations[2]. Data driven change to regulations, processes and procedures can aid in mitigating these risk factors.



[2] Aviation Safety Reporting System (ASRS) (https://asrs.arc.nasa.gov/search/database.html)

Aerial Infrastructure inspections using sUAS will continue to become more sophisticated and efficient. As evidenced from data analyzed through the Aviation Safety Reporting System (ASRS), similar to traditional Piloted operations, most UAS Operational incidents occur due to human factor, aircraft, or procedural issues and/or deviation/violation to procedures and regulations. As operations become more intricate in nature, it becomes increasingly important to have robust regulations and procedures in place. mba Aviation, the exclusive Registered Audit Company in North and South America to audit UAS operators against the UAS International Standard (UIS), can assist UAS operators with consulting services that aid in building a Safety Governance structure based on data driven analysis.

If you have any questions, comments or would like to discuss any of the above topics in more detail, please contact mba Aviation's safety team at safety@mba.aero.