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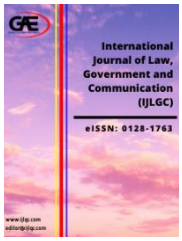

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THE PRINCIPLE OF *AD COELOM* IN RESPECT TO THE LOW-ALTITUDE AIRSPACE FOR THE COMMERCIAL UNMANNED AERIAL VEHICLES (UAVs) IN MALAYSIA

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Abstract:

The development and innovation of unmanned aerial vehicles (UAVs) or drones especially in the commercial arena are predicted to give a positive impact on socio-economic growth in Malaysia. Malaysia has been chosen in this discussion to evaluate the development of UAV laws and initiatives by Malaysia's Civil Aviation Authority to uphold commercial UAVs in line with the International Civil Aviation Organization's (ICAO) mission to provide the fundamental international regulatory framework through Standards and Recommended Practices (SARPS) in addressing UAVs. Nevertheless, the existing laws in Malaysia regarding the right of way and right to use low-altitude airspace did not offer much for commercial UAVs due to the *ad coelom* principle. The right to use airspace for commercial UAVs shall be the first and major concern in moulding the UAV laws. This article is aimed to analyse and evaluate the relationship of the *ad coelom* principle with the laws available in Malaysia which might honour the right to low-altitude airspace for commercial UAVs. This article adopts doctrinal research by referring to the available laws and regulations in Malaysia to see the integration of the *ad coelom* principle with the right of way and right to low-altitude airspace for commercial UAVs. The concept of 'avigation easement', 'drone corridor', and 'drone-port' could be the best solutions in determining the right of ways for commercial UAVs to reflect the *ad coelom* principle. Therefore, the Civil Aviation Authority of Malaysia (CAAM), the Federal government, all States, municipal councils, and private individuals shall be ready to draw zoning of airspace horizontally or vertically without neglecting public rights and breaching other laws. This is to realize the CAAM mission for the integration of Air Traffic Control (ATC) in controlling the navigable airspace of manned aircraft which is to be extended to the UAVs by the year 2035.

Keywords:

Airspace, Easement, Navigation, Unmanned Aerial Vehicles, Zoning.

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Introduction and The Development of Commercial UAVs in Malaysia

The recognition of unmanned aerial vehicles (UAVs) in Malaysia is expanding and spreading from personal use to commercial use as a result of the transformation of societies that currently live in the world of digitalization. The UAVs are somewhat convenient for commercial use due to their nature that relatively small, light, and fast. Due to the nature of unmanned flying aircraft, some people consider UAVs as artificial intelligence technology that equips with smart technologies and functions, and high-quality Go-Pro cameras which able to view high-definition video quality mounted and controlled remotely by the operator through a smartphone. Today, most UAVs are functioning to replace the conventional methods of everyday human routines, especially for commercial purposes which cover all aspects of the economy like shipping and delivery, agriculture, marketing, and many others. However, how quickly this technology advances in one society will influence the regulations that govern its use. There are many global unanswered questions and debated issues regarding the UAV. The first ICAO exploratory meeting on UAVs was held in Montreal on 23 and 24 May 2006 with the goal to develop Standards and Recommended Practices (SARPS) for UAVs with the ultimate aim to ensure the safety of any other airspace users as well as the safety of persons and property on the ground. Malaysia as a member of ICAO and a signatory to the Chicago Convention is bound to reflect the SARPS of UAVs into the national law. The fast pace of UAV technology development and the diversity of UAV uses are two of the key issues that legislators confront in regulating UAVs both internationally and domestically. (Hodgkinson, D., & Johnston, R., 2018).

One major problem in realizing the commercial use of UAVs is the infrastructures that are connected to this technology itself. The right of way and use of airspace is considered an integral part and the first major topic that shall be discussed in developing commercial UAV infrastructures. Thus, the law related to the right of way and use of airspace for commercial UAVs shall be properly managed and determined by the relevant parties, especially the CAAM. Assume you had a car but no road and infrastructure on which to drive it. Similarly, due to the rigidity of the law, the main infrastructure of the right of way is not available for this new UAV technology. Laws should be adaptable to the needs of society.

The usage of UAVs can be divided into three main streams; 1. Public and surveillance; 2. Commercial; 3. Private. There is not much debate on the usage of UAVs by law enforcement for purpose of surveillance except in terms of privacy and human rights issues. Further, the usage of UAVs for private purpose as hobby and recreation are subject to similar restriction to commercial purpose. Currently, the market has demanded the usage of UAVs in the commercial sector which is seen can boost the economy of the nation. Commercial UAVs are still in the development stage in Malaysia, despite the establishment of Area 57(The Star, 2021) and the Drone and Robotic Zone (DRZ) Iskandar Puteri (Shah, M.F, 2020) as a centralized hub and centre for drone and robotic research. Therefore, the ability of UAVs for the commercial sector is still uncertain subject to the laws and regulations in Malaysia. The collaboration of global logistics company DHL, Malaysian Global Innovation and Creativity Centre (MaGIC) and Iskandar Investment Berhad (IIB) in DRZ Iskandar is to boost the digital economy to the next level (Shah, M.F, 2020). The participation of DHL Express is crucial to make delivery and logistic service compliant as well as technically and commercially feasible in Malaysia and abroad, in line with the global rise of UAV delivery (Digital News Asia, 2020). The use of unmanned aerial vehicles (UAVs) may enable autonomous, contactless shipping services in

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distant places and from shore to vessel to shore. Iskandar Investment Berhad (IIB) created the largest Drone Test Site (DTS) in Iskandar Puteri, which it claims to be the largest in Southeast Asia, to accommodate and test UAV flying for both visual line of sight (VLOS) and extended visual line of sight (EVLOS) (Digital News Asia, 2022). Furthermore, commercial UAVs are growing in the agriculture sector, where more farmers are using UAVs to spray and monitor crops, providing sustainability in farming management. The novel technologies such as drones, robotics, and automation are being used by the agriculture sector as instruments to help manual labour and enhance yields by making operations and processes faster, safer, and more cost-effective (The Star, 2022). The operation of UAVs in agriculture is currently widely used in paddy fields and oil farm plantation filed (The Star, 2022). Although there are various initiatives by government and corporate bodies to promote the commercial use of UAVs, they are still subject to Malaysian law and regulations. There are several restrictions have put forward by the CAAM for the private and commercial use of UAVs, and the main problem is they are yet to determine the exact line of altitude for the utilization of low-altitude airspace for the commercial sector. This in fact will impact and incapacitate the growth of commercial UAVs in the industry. The law must be available to grant the UAV the right of way to fly in the airspace in order to accommodate the growth and demand of UAVs in the commercial sector. The absence of law will cause chaos and may exacerbate the issue of trespass as a result of indeterminate law and infrastructure provided by the relevant authority. However, as of now, CAAM's initiative to honour commercial use of UAVs has been reflected in several regulations, including the introduction of two special directives: 1. Civil Aviation Directive Part (I) Remote Pilot Training Organization (CAD 6011 Part (I)-RPTO); and 2. Civil Aviation Directive Part 6011(II) Agriculture UAS Operations (CAD 6011 Part(II)-UAS AGR. These two directives provide safety requirements and procedures for commercial UAV operations in various industries and agriculture. The approval and permit to fly UAVs are subject to the types and categories of UAVs. UAVs in Malaysia have been categorized into three types depending on their usage which are; 1. Open, 2. Specific, and 3. Certified. Malaysia has followed and adopted the European Union Aviation Safety Agency (EASA) rule in categorizing the UAV (EU Regulations 2019/947 and 2019/945).

Generally, the current law in Malaysia restricts the use of UAVs in Malaysian airspace provided the operator obtains prior approval from the CAAM and other government agencies like the Department of Survey and Mapping (JUPEM), Chief Government Security Office (CGSO), and Malaysian Communications and Multimedia Commission (MCMC). Additionally, the CAAM only permits commercial UAVs to fly in the airspace at a maximum altitude of 400 feet above the ground without interfering with the 500-foot-high navigable airspace currently used by manned aircraft. (Rule 140(4), Malaysian Civil Aviation Regulations 2016). The minimum range of low-altitude airspace is yet to be determined by CAAM and does not reflect in any legislation which is left to the grey area of law and trespass issue. The undefined low-altitude airspace for UAVs eventually poses a quandary in terms of ownership because it is located between proprietor airspace and navigable airspace of manned aircraft.

Methodology

This article is a mixture of qualitative and legal research. The method used in this article is based on the evaluation and analysis of the available laws in Malaysia, particularly the primary source of law in the federal legislation and various state legislations and the secondary source of law *vis-à-vis* the *ad coelom* principle which possibly could be integrated to the utilization of

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low-altitude airspace for the commercial UAVs. The inductive analysis is conducted in this research to inspire the discussion of the available rights of low-altitude airspace for UAVs. The data collected for this research is a content analysis where the provisions of laws in the Federal Constitution, the National Land Code and the State Land legislations are appropriately referred to analyse the main idea of this research. Furthermore, the international convention also is being referred to highlight the international stand on the right to utilise low-altitude airspace for commercial UAVs. UAV Laws and regulations from other countries especially Rwanda also being referred to in this article. Apart from that, secondary sources from the selective authors in the published journals and articles are gathered to inspire the discussion of the UAVs' airspace and the principle of *ad coelum*.

Airspace and *Ad Coelom* Principle

Airspace is often regarded as free territorial and unoccupied. Thus, some people will regard airspace as a public space and are incapable to own the airspace, thus airspace ownership usually is off from the discussion. The *ad coelom* is translated as " to heaven". This principle is derived from the common law which is based on the Roman law maxim *cujus est solum, ejus est usque ad coelom* universally interpreted as 'anyone has the land owns all the space above to an unlimited extent' integrated into the English common law rule which was supported by Sir Edward Coke and Lord William Blackstone (Giboney, P., 2015). Thus, it is crystal clear in land law *vis-à-vis* the rule of *ad coelom* of airspace where the proprietor of land has exclusive ownership of the land so much the beneath and the skies above the surface of the land. Most of the proprietors of land are unaware that they have right over reasonable airspace above the surface of their land. In addition, the word 'reasonable use' here is referring to the reasonable usage of the proprietor of land over the airspace and it is left to the court to interpret what constitutes reasonable. Although the nature of the airspace is uninhabited, in reality, the lower altitude of the airspace is owned by a proprietor of the land. However, the law did not state exactly which altitude is belong to the proprietor of the land. Furthermore, section 44(1) (a) of the National Land Code 1965 provides the proprietor of land has exclusive use, rights, and enjoyment of land which includes the surface of the land, the airspace as well as beneath the land. As a matter of fact, airspace is included as part of land ownership. Under the common law, the proprietor of land can bring an action for trespass against individuals who enter the proprietor's land without his or her consent. Most trespass action in court involving the ground level of land and the ownership of airspace is occasionally raised in the court of law. The debate of airspace ownership had been discussed in the case of Causby, where the court ruled the principle of *ad coelom* of airspace where the proprietor of land owns reasonable ownership of low-altitude airspace and exclusive control of the immediate reaches of encircling atmosphere, therefore the defendant was held liable for trespass (United States v. Causby, 264). In this case, a farmer resided next to a military airport, and planes flew as low as 83 feet over his property. As a consequence of the aircraft's sound, the farmer's hens were traumatized, leading them to fly into walls and die. As a result, Causby filed a trespass suit against the U.S. government. Justice William O. Douglas ruled that, as the law states, the air is a public highway. If this were not the case, every transcontinental flight would face floodgate trespass lawsuits. (United States v. Causby, 261), the landowner possesses at least even more space above the surface as he can use or occupy in relation to the land. (United States v. Causby, 264).

The extent of the proprietor's sovereignty over the airspace remains ambiguous, leaving a large question mark and overlap claim for the low-altitude airspace for UAVs. The proprietor's ownership of the airspace is not absolute and subjective, and it is assessed on a case-by-case

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basis. What is considered reasonable in one circumstance may not be in another. As a result, the authority and legislation cannot currently specify the minimum low-altitude airspace for UAVs to fly. As a result, the operators are expected to fly the UAVs inside the specified bounds. As a result, it may stifle the growth of commercial UAVs in operations involving beyond the line of sight.

The exclusivity of the right of way and use of airspace is a part of a 'land' matter as provided under the National Land Code and by virtue of the Federal Constitution as mentioned in the List II of the Ninth Schedule, where land is constituted under the jurisdiction of State matter. In contrast, UAVs are under the jurisdiction of the Federal level which is covered under the heading of 'aviation' as provided in List I of the Ninth Schedule of the Federal Constitution. In dealing with the right of way of commercial UAVs over low-altitude airspace, it shall be the state and private persons who own lands to grant appropriate permission to fly UAVs in low-altitude airspace. However if dealing with navigable airspace, permitting to operate and fly UAVs on the other hand, the CAAM shall be the main authority to set the limitation for the right to use airspace by commercial UAVs. The use of airspace shall be determined and highlighted for the protection of the proprietor of the land against any trespass or nuisance from the flying UAV. As spacious as the skies, irony it is owned by somebody.

Navigable Airspace and Classes of Airspace

Airspace can be owned by both private and public entities (Thompson, D., 2019-2020). The navigable airspace is considered public airspace, and it is governed by the CAAM, which imposes numerous restrictions and limitations. The term 'navigable airspace' refers to federal airspace that is above the minimum flight altitudes and includes airspace required for safe take-off and landing, which is usually set at 500 feet over the ground. The minimum navigable airspace for manned aircraft has been set at the international level as provided by the International Civil Aviation Organization (ICAO) in Annex 11 which is 500 feet from the surface of the land. The limitation set by ICAO is a standard altitude for other flying objects including the UAV. According to ICAO, navigable airspace is divided into seven classes of airspace that are controllable by the Air Traffic Control Service (ATS) which involves manned aircraft; 1. Class A, 2. Class B, 3. Class C, 4. Class D, 5. Class E, 6. Class F and lastly 7. Class G (2.6 of Annex 11 of ICAO). These classes and classifications of airspace are aimed to enable the safe control of aircraft and to prevent collisions with sufficient support of information and other support from the ATS.

Furthermore, Part 107.41 of the Small Unmanned Aircraft System Rule of the United States of America (the USA) restricts UAVs to fly in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E unless prior approval is granted from the Air Traffic Control (ATC). Unmanned aerial vehicles (UAVs) are not permitted to operate at the same height or in the same airspace as manned aircraft. The UAV's approach to flying in the airspace is similar to that of a hot air balloon, which flies in low-altitude airspace due to its low speed and short range. Today, as UAVs open up new and beneficial applications of low-altitude domestic airspace, demand is escalating for land law to evolve. Nevertheless, state legislators might help by establishing new laws that provide proprietors of land clear rights to exclude UAVs and other aircraft from flying in the low-altitude airspace atop their land up to the current navigable airspace limit, which in most regions is 500 feet over the surface. (Troy A. Rule, 2015). However, this exception rule to exclude UAVs to encroach on low-altitude airspace of private property may create ineffective law, especially in cases

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involving trespass, nuisance, and even privacy issues. The existing trespass law should be sustained, but there should be another alternative method to allow commercial UAVs to use low-altitude airspace for economic growth.

At that point, which altitude of airspace is suitable for commercial UAVs? Since UAVs have given low-altitude and mid-altitude airspace new respect and honour, landowners in almost all jurisdictions lack a clear right to exclude UAVs as they would a trespasser on the land, despite what people think. (Gustafson, L. P., 2017). Unlike manned aircraft, UAVs especially commercial UAVs usually fly in a short distance and period but require to fly in low-altitude airspace. In Rwanda, the operators of UAVs are not permitted to fly UAVs at heights above 120 meters (400 feet) except they obtain special authorization from the Rwanda Civil Aviation Authority (Part 27.095, Rwanda Civil Aviation Regulations-Part 27 Unmanned Aircraft Systems). In addition, a person who operates a UAV must give up the right of way and stay clear of all manned aircraft on the ground and in flight (Part 27.125, Rwanda Civil Aviation Regulations-Part 27 Unmanned Aircraft Systems). The Rwanda legislation emphasises the importance of manned aircraft navigable airspace over UAVs for safety reasons, as manned aircraft carry heavier loads than UAVs.

Moreover, according to Rule 140(4) of the 2016 Malaysian Civil Aviation Regulations, the CAAM only permits UAVs to fly in the airspace at a maximum altitude of 400 feet above the ground, keeping them away from the manned aircraft's existing navigable airspace at 500 feet above the ground. The categorization of UAVs in Malaysia is based on the risk-based approach according to the weight of the UAVs. The open and specific categories are the types of UAVs that usually fly in low-altitude airspace with a weight of fewer than 20 kilograms and they are expected to fly within the line of sight of the operator. The operator shall be able to see the UAV while operating it. The open category is usually for a private purpose which includes recreation and hobby and is considered a low-risk UAV. On the other hand, the specific category of UAV is a medium-risk UAV that must fly within a visual line of sight (VLOS) and the operator of the UAV is required to obtain prior approval from the CAAM to fly the UAV. The certified category, further, is a type of UAV that weighs more than 20 kilograms and has capabilities like a manned aircraft and can fly at higher altitudes like manned aircraft thus carrying a greater risk to the public. The specific category is proposed as the most suitable and safest UAV for commercial purposes because that type of UAV is lighter, smaller, and capable of flying in a short distances and low-altitude airspace. The commercial UAV shall maintain its altitude between 200 feet and 400 feet without encroaching on either the navigable airspace or the private airspace of a landowner. In reality, manned aircraft and unmanned aircraft shall not share similar navigable airspace. The segregation of airspace for unmanned aircraft shall start from the surface of the land until an altitude of 400 feet from the surface of the land. The integration of UAVs into national airspace has the potential to generate enormous economic benefits. (Gustafson, L. P., 2017). The integration further can create more job opportunities, increase tax revenues, and may fascinate investors. UAVs provide the prospect of significant job creation and growth for the general public in a still-recovering economy UAVs can bring in millions of dollars in additional tax income for state and local governments (Giboney, P., 2015). Therefore, the UAV navigable airspace must be finalized to impact the mission of CAAM in upholding the Chicago Convention to integrate utilization of airspace for both manned aircraft and unmanned aircraft by the year 2035.

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Zoning the Airspace

With seven layers of the atmosphere with different altitudes, as of today, the Air Traffic Control (ATC) has jurisdiction to control the navigable airspace of manned aircraft from the altitude of 500 feet from the surface of the land and above. ICAO has begun the consultative research required to establish 'low-altitude traffic management guidelines' for UAVs at the domestic level, as evidenced by ICAO's inaugural 'Drone Enable' Symposium in Montreal, Canada, in September 2017. (Hodgkinson, D., & Johnston, R., 2018). To realize the mission of CAAM to integrate ATC for both manned and unmanned aircraft by the year 2035, the appropriate mapping and zoning of the airspace shall be sketched to avoid future interruption. The National Aeronautics and Space Administration (NASA) currently developed UAV Traffic Management Project (UTM) to safely manage and integrate UAVs into low-altitude airspace. UTM provides a standardised communication system and effective air traffic management for UAVs flying in low-altitude airspace without interfering with ATC's control of manned aircraft (Blake.T, 2021). NASA comprehends that UAV technology is developing especially its demand in the commercial arena. Thus, the safety infrastructure like UTM can further create geo-fencing, 'detect and avoid' for the smooth running of the system.

The airspace at altitudes between the surfaces of land until 400 feet from the surface of land can be declared as UAV airspace where it relatively flies within the low-altitude airspace. The UAV airspace can further be segregated vertically and horizontally to project a proper infrastructure and right of way and use of airspace for commercial UAVs. Vertical zoning is based on the altitude of the airspace. Conversely, horizontal zoning is based on the location of airspace. As of today, CAAM and Civil Aviation Act provides several horizontal restrictions to certain locations concerning flying the UAV. Putrajaya, Kuala Lumpur International Airport (KLIA), and other government premises are listed under the prohibited locations to fly UAVs. The rules on UAV operation must take place during daylight hours, and the UAV must remain within the operator's visual line of sight is referred to as horizontal zoning. Mapping the UAV zoning by permitting the commercial UAV to fly either beyond the visual line of sight (BVLOS) or within the visual line of sight (VLOS) is also considered horizontal zoning since it limits the mobility of the said UAV within the visual acuity or the specific radius kilometre. BVLOS allows UAV operations in which the remote pilot is not required to maintain the unmanned aircraft in visual line-of-sight at all times (Part 27.005, Rwanda Civil Aviation Regulations-Part 27 Unmanned Aircraft Systems). Besides, VLOS is an operation in which the pilot or UA observer maintains unaided visual contact with the unmanned aircraft (Part 27.005, Rwanda Civil Aviation Regulations-Part 27 Unmanned Aircraft Systems). The Rwandan UAV Regulation also includes some horizontal restrictions based on weather, with Part 27.115 stating that no UAV shall be operated in or into a cloud, at night, or in conditions other than visual meteorological conditions based on ATC clearance. Meanwhile, in Malaysia, the operation of any UAV with BVLOS is prohibited and requires prior authorization from CAAM. This is yet another safety issue that Malaysia is unwilling to accept despite the commercial values and advantages of BVLOS operations.

Furthermore, in vertical zoning, the airspace segregates according to the altitude with definite lanes for passage according to the different categories of UAV usage. The authority shall offer the vertical zoning of airspace to avoid the situation of trespass, and drone operations below 200 feet have a net impact of lowering societal welfare because UAVs impose significantly higher privacy costs while providing minimal additional economic benefits (Hazel, R. A, 2018). Another question to highlight with regards to commercial UAVs in

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delivery services that have to fly even lower and below the altitude of 200 feet from the surface of the land, surely this issue shall be resolved properly to avoid future trespass and nuisance to the public. The solution to flying UAVs in low-altitude airspace is stated in Malaysian land law, National Land Code as well as States legislations. Conversely, the application for use of that particular regulation is yet to be applied specifically to the UAV as the generality of the provisions. The term used in the National Land Code and States' Land Rules is the permit to use the airspace of State land and any reserve land. Therefore, if a commercial UAV flies across the airspace of a State land or reserved land, the operator must get a permit to use the airspace for the purpose specified in the said regulations.

For example, Rule 19(d) of the Perak Land Rules 1966 implies that the State may issue a permit to utilise the airspace in certain circumstances, with fees imposed on the applicant. Commercial UAVs may fall under the description of "other purpose" as defined in Item 4 of the said rule, and the State Authority will set the fees for that purpose. Furthermore, the fees payable for a permit to use air space under section 75D of the National Land Code are outlined in Rule 25 of the Selangor Land Rules 2003. This rule specifies seven separate fees that must be paid, which are further classified into three categories: public, private, and commercial. The use of an unmanned aerial vehicle (UAV) may fall under the description of Item 7: "other usage". The charge for a permit to use airspace is RM40 per year if the UAVs fly for commercial purposes above state lands in Selangor. The applicant must submit and attach a sketch plan of the use of airspace to the application made under Schedule XVIII of the Selangor Land Rules 2003 (Paragraph 51 (r)). The applicant must indicate the grounds and justifications for the assignment of permission to utilise airspace above State land or reserved land in the application under Schedule XIX of the Selangor Land Rules 2003 (Paragraph 51 (s)).

Furthermore, Rule 26 (1) of the Perlis Land Rules 1987 states that the State Authority may issue authorization to any person or body corporate to use any airspace above State lands or reserved areas. Rule 26 (2) of the Perlis Land Rules 1987 also lists six items (a) until (f) with specified fees that fall into three categories: public, private, and commercial. The State Authority shall set the yearly charge for a permit to utilise airspace for a purpose other than those listed in paragraph (2) of this Rule (Rule 26(3), Perlis Land Rules 1987). Thus, this rule may apply to commercial UAV operators if they operate above any State land or reserved land, in which case they must apply for a permit to use airspace as stipulated under section 75B of the National Land Code, by using the required form 4D and paying the prescribed fees ofRM50.00.

Furthermore, Rule 38B(1) of the Johore Land Rules 1966 (J PU39/1966) asserts that an application for a permit to use airspace above State land or reserved land must be submitted in the form prescribed in Schedule18, with the applicant highlighting and attaching a plan of the intended use of airspace. Further, any application for the assignment of a permit to use airspace above state land or reserved land under section 75E of the National Land Code 1965 must be made in the form prescribed in Schedule19, be accompanied by the prescribed fee, and provide justifications for the particular assignment (Rule 38B(2) of the Johore Land Rules 1966). The Administrator's permit to use airspace, to erect, maintain, and occupy a building on State land or reserved as an extension of any building on an adjacent lot, flyover, bridge, and "others" is calculated according to Rule 38C(1) of the Johore Land Rules 1966. Commercial UAVs may fall under the definition of "others" as defined in Rule 38C(1). The

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administration charge for an application to use airspace above State land or reserved land is RM100 per title, according to Item 36 of Table V.

The Terengganu Land Rules 1966 (Tr PU11/1966) came into effect on January 12, 1966. The application for a permit to use airspace under section 75A of the National Land Code 1965 must be made in writing in Form E set out in Schedule 9, addressed to the Land Administrator of the district in which the land is located, and the applicant must submit and attach the intended plan of use of airspace to the application. According to Rule 4A(4) of the Terengganu Land Rules1966, the District Land Administrator has the authority to reject any application that is not in the appropriate form or that, in his opinion, does not disclose adequate particulars about the applicant or the land. Furthermore, except for an application that has been rejected under Rule 4A(4), the District Land Administrator shall keep a "Record of Permits to Use Air Space" in Form F of Schedule 10 in which the details of each authorised permit are recorded. Any approved application for the assignment of a permit to use airspace must be documented in a "Record of Permits to Use Air Space" (Rule 4A(7), Terengganu Land Rules 1966). The application for a permit to use airspace under section 75E of the Code must be made in Form G, which can be found in Schedule11, and must include the applicant's justifications for the request (Rule 4A(6), Terengganu Land Rules 1966). Rule 18A also establishes a fee schedule for permits issued for the use of air space over the State land or reserved land, which is divided into three categories: (a) for residential purposes, RM4.00 per square metre subject to a minimum ofRM40.00 for each lot per year; (b) for office or shop building, RM6.00 per square metre subject to a minimum of RM60.00 per lot per year; and (c) for other purposes, The fees are determined by the State Authority. Rule 18A(c) may be invoked for the application of a permit to use airspace for the commercial use of a UAV.

In addition, Pahang Land Rules 1992 Phg PU27/2015, which came into effect on January 1, 1994, included various requirements regarding the permit to use airspace above State land and reserved land. The application for a permit to use airspace above State land shall be made in Form 6 and directed to the Administrator of the district in which the land is located, as per Rule 35 (1) of the Pahang Land Rules 1992. The Administrator may refuse any application that is not in the prescribed form or that, in his opinion, does not provide adequate information about the applicant or the land (Rule 35(3), Pahang Land Rules 1992). Rule 36 illustrates the fees payable annually for a permit to use airspace in respect of permits issued under rule 35 according to the usage listed under item(1) until (6); Passageway, Cantilever/Balcony, Overhead Bridge, Motorway, Canopy, and Porch; and within three categories of public purpose, private purpose, and commercial purpose. Regrettably, the provisions and words "other purpose or usage" were not included in the Pahang Land Rules 1992 like other States' Rule. As a result of the inflexibility of the laws, the right of way and use of airspace for commercial use of UAVs cannot be construed under the Pahang Land Rule.

The State Authority of the State of Kedah, in exercising the authorities given by sections 14 and 445 of the National Land Code, has established the prescribed fees for the application for consent to any assignment of right over air space, which is RM200 per application (Rule 37(1) item 81 of Kedah Land Rules 1966). Furthermore, the prescribed fee for applying for a permit to use airspace in Malacca is RM100 per application, according to Rule 20 (1) item 50 of the Malacca Land Rules 1966. Both the Kedah Land Rules and the Malacca Land Rules, unlike other State Land Rules, do not go into extensive detail about the categories of assignments and purposes for using airspace, leaving room for interpretation.

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Easement and Leasing the Airspace

Furthermore, a private person or landowner may invoke section 282 of the National Land Code to grant an avigation easement for the operator of a commercial UAV to fly the UAV if the UAV happens to fly within the airspace of the proprietor's land. Avigation is from words of aviation and navigation. An easement is a form of dealings in land law and it offers a right to cross the proprietor's land for a specific purpose. In other words, an easement is an agreement between the owner of the land and the tenant to use a part of the owner's land for the right of way for a specific purpose and a specific period. Further, an avigation easement involves permission to use the low-altitude airspace of the proprietor of land for commercial purposes. Because airspace is considered to have been a part of land ownership, the avigation easement is another alternative method for designing the infrastructure of a commercial UAV. Section 283 of the National Land Code further explains the positive easement where the grant of the easement shall state specifically the purpose of the easement and in the case of UAV, the purpose shall be to use reasonable airspace of the proprietor to fly the UAV. This avigation easement can be created and registered by express grant and prompted by way of executing an instrument in Form 17A of the National Land Code (section 286, National Land Code 1965).

For example, Google's Prime Air has succeeded in commercializing its UAV and they are willing to pay the landowners for the use of its UAV's avigation easement. The payment of an avigation easement is regarded as the landowner's consideration and agreement for consent and reasonable interference with his enjoyment of his airspace (Watson., T, 2020). The avigation easement is typically sought to secure airspace for airport and runway proximity security as well as noise compatibility operations. (Widener, M. N., 2016). The application of avigation easement can be extended to the development of drone ports as it offers comprehensive infrastructures of take-off and landing for commercial UAVs due to the increasing demand in the commercial arena to use UAVs, especially in the delivery and logistic sector. According to Staff Writer (2015), Rwanda could be the first nation in the world to have a UAV airport network, with its civil aviation authority allegedly drafting rules and regulations in the optimism of investor interest in developing a logistics system in Africa to deliver medicine to remote areas that are difficult to access by road. The drone port is another infrastructure project that might provide a standardised take-off and landing site for commercial UAVs while maintaining the allowed payload limit. Unlike private use of UAVs, which do not require a runway to take off because they may be launched from private properties, commercial usage of UAVs is far more likely to require a drone port in the future due to the expanding capacity of commercial transactions. (Gustafson, L. P., 2017).

Further, another crucial infrastructure for commercial UAVs is the drone corridor, it is based on the regional location where the government, States, or even the municipal councils may declare certain places as friendly UAV zone. Malaysia has established a Drone-corridor concept in Johor, making it the first country in Southeast Asia to provide UAV-friendly zones and robotic zones. The Johor State Government created Drone and Robotic Zone (DRZ) Iskandar in Iskandar Puteri, Johor, as a public-private collaboration with other companies by introducing an eco-friendly robotic project that intends to establish a UAV-friendly zone in their development networks. UAVs are allowed to fly freely in this area for research and development. CAAM has also recognised this project as a way to inspire more innovation in UAV projects. DRZ Iskandar is regarded as a one-stop area for all UAV inventors interested

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in creating and experimenting with commercial UAVs in a specially defined region of the Drone Test Zone (DTZ). Several companies like DHL Express Malaysia, Federal Land Development Authority (FELDA) are now collaborating on this project to generate social impact and financial value through the deployment of UAVs in their respective sectors.

Another alternative method that is manageable and practicable to administer the commercial UAV infrastructure is by leasing the lower altitude airspace based on the existing highway or expressway. Right of way is essential for safely and efficiently bringing manned and unmanned aircraft together in common airspace (Hodgkinson, D., & Johnston, R., 2018). ICAO also confirms that the right of way rules will endure vital for the safe operation of aircraft, with or without a pilot on board (Part 107, Circular 328-AN/190, 1CAO). The creation of a drone highway or UAV airspace way is manageable and controllable with different methods of inspection. The drone highway refers to the UAV routes above the established grade contour of highways. Due to the demand for commercial UAVs, the infrastructures of the drone highway shall be as large as the length of highways in Malaysia. The blueprint of routing and mapping the UAV infrastructure together with monitoring the UAV traffic can be set accordingly as similar to highway traffic control. In other words, the usage of highways and expressways in Malaysia will be comprehensive from the surface of the land, beneath land to the airspace of land, and subsequently contribute to the sustainability of the Malaysian economy. The company may impose certain fees on the operator of commercial UAVs for the administration and leasing of the UAV airspace-way. Commercial drone operators could use this information to contact the appropriate state department and negotiate the lease of highway airspace (Thompson, D., 2019-2020). Nonetheless, once a drone-highway system is expanded to cover flights over private parcels, drone companies will have to manage potential tort liability. However, until then, drone delivery companies can keep above the roadways and avoid trespass and tort liability (Thompson, D., 2019-2020).

According to section 221 of the National Land Code, leasing involves a conveyance by the proprietor of land (lessor) grants to any person (the lessee) interest and enjoyment of the land either wholly or partly for the duration of three years up to thirty years (for part of the land) or ninety-nine years for the whole of land (section 222, National Land Code 1965). This type of land dealing shall be registered in the Land Registry (Form 15A, 15B National Land Code). From the perspective of a commercial UAV, the concept of leasing airspace by designing a drone highway shall be for three years, as commercial UAVs evolve. The lease will involve a piece of land in low-altitude airspace. The drone highway is more practical as it offers vertical and horizontal mapping which keeps the UAV flying within the borderline of highways and subsequently may avoid trespass to private property. These drone highways also could spot which areas that most suitable for commercial UAVs to fly over the airspace and could avoid the overpopulated area. Thus, the initial horizontal restrictions in rules or regulations of the Civil Aviation Act are still relevant in the application of drone highways. The most practicable option for highway airspace conveyances would be to create horizontal zoning at a predetermined height above the highway surface. The vertical limits of the imparted airspace would be set by right-of-way borders. Many emerging technologies, such as the UTM platform, have the potential to identify these borders and assist autonomous UAVs in navigating these paths (Thompson, D., 2019-2020). Another gap in the drone highway is how to assure the safety of other motor vehicles on the roadways if a commercial UAV flies right above their roof. The commercial UAV must be equipped with the latest geofencing, ‘see and avoid,' and weather detection technology as part of the safety requirements of device approval

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from the Standard and Industrial Research Institute of Malaysia (SIRIM) as part of the mandatory requirement for a permit to fly a UAV from the CAAM. As mapping the right of way for UAVs is applicable across jurisdictions, the size and features of commercial UAVs should be primordial consideration in developing rules governing the right of way for commercial UAVs within the limits allowed by the Civil Aviation Act.

Conclusion

In summary, Malaysia must be prepared to allow commercial UAVs to fly into low-altitude airspace once all infrastructures associated with commercial UAVs have been finalized by all agencies because UAVs have the potential to open up new economic opportunities and provide a competitive advantage. Since the pandemic of Covid-19, all commercial entities all over the world have collapsed especially in the aviation and commercial industries. The commercial UAV is regarded as the best and alternative method for practising new norms and social distancing. This new era offers the world to accept the benefits of UAVs in the commercial sectors. Thus, harmonization and cooperation from the Federal government, State government, municipal councils as well as individual private people are mandatory to compromise and to provide comprehensive infrastructures and the right to utilise low-altitude airspace for the commercial UAV successively to realize the CAAM's mission and the Chicago Convention in the integration of airspace for both manned and unmanned aircraft by the year 2035. As of today, the law of airspace will show a new perspective since the case of Causby, to extend to commercial unmanned aircraft. The application for a permit to use airspace in the states' land law and National Land Code also may be extended and applicable for commercial UAVs. A uniform drone highway is one big dream and innovation that could serve and benefit many sectors of the economy. From the law perspective, the drone highway can be validated by applying the existing laws without having to amend any laws or regulations. The notion of leasing and easement of airspace are two land law transactions available to provide interim infrastructure while waiting for the government to proclaim navigable airspace for UAVs by 2035. This commercial UAV will not only impact the domestic market but will continue to grow worldwide with the "cross-border UAVs". In brief, the *ad coelom* principle of low-altitude airspace for commercial UAVs can be further extended in Malaysia to affect socio-economic demand in this new digitalization era. The right of way for low-altitude airspace should be regulated between 200 feet and 400 feet above the land's surface, subject to navigable airspace for manned aircraft and proprietor airspace. After all, while the CAAM and government are still working on determining the exact altitude for the UAV airspace and declaring the navigable airspace for UAV, land laws have provided alternative ways to influence the demand for commercial usage of UAVs in all sectors of the economy. Idealistically, the approach of the *ad coelom* principle over the proprietor's airspace is not absolute, giving commercial UAVs the chance to grow and designate low-altitude airspace as UAV navigable airspace by the year 2035.

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