

THE REGULATION OF COMMERCIAL USE OF UNMANNED AERIAL VEHICLES IN MALAYSIA

BY

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ABSTRACT

The rapid expansion of the use of unmanned aerial vehicles (UAVs) in the commercial arena demonstrates society's great acceptance towards technological advancement in Malaysia. The existing rules and regulations on UAVs in Malaysia do not offer an adequate framework for the commercial use of UAVs. The legislation does not explicitly address the right to a passageway or airspace for the commercial use of UAVs which will further be vulnerable to the floodgate of legal issues of trespass and nuisance. Since the deployment of commercial UAVs in Malaysia are still in the early stages, the implication of commercial UAVs to the public, especially liability in negligence, is still vague. This qualitative legal study examines the laws and regulations governing the commercial use of UAVs in Malaysia and other countries to determine the best approach for Malaysian application. It employs a critical legal analysis and descriptive research of commercial UAVs. This research relied on primary and secondary legal sources such as legislation, rules, regulations, directives, case laws, books, academic journals, and newspapers. This research argues that in order to have a comprehensive law on the commercial use of UAVs, the laws shall first provide and define an explicit provision on the right to low-altitude airspace for the UAVs as it is regarded as the most significant infrastructure. This research examines the law governing easement and leasing of airspace as the alternative methods for commercial UAVs to fly in the airspace. This research further argues that the principle of strict liability and breach of warranty shall be assessed based on the duties and liabilities arising from the contract the parties enter. Furthermore, this research observes the assessment of risks, which is the key element in the commercial UAVs, by measuring the foreseeability of risks to provide security and safety to the public. This research is vital and significant for clarifying any ambiguity of UAV laws, especially on the rights to UAV airspace and other legal issues, to promote the demand for commercial UAVs in the market, and to attain public trust and confidence in using commercial UAVs in Malaysia. This research suggests that the Civil Aviation Authority of Malaysia (CAAM) shall be ready to draft regulations for the specific operations of commercial UAVs individually towards the effectiveness and efficiency of commercial UAVs in risk management. The untouched area of the low-altitude airspace for the commercial UAVs shall be declared between 200 and 400 feet from the surface of the land to segregate accordingly the proprietor's reasonable airspace and the navigable airspace of the manned aircraft.

خلاصة البحث

يوضح التطور السريع في استخدام المركبات الجوية بدون طيار (UAVs) في الساحة التجارية قبول المجتمع الكبير للتقدم التكنولوجي في ماليزيا. ولا توفر القواعد واللوائح الحالية المتعلقة بالطائرات بدون طيار في ماليزيا إطارًا مناسبًا للاستخدام التجاري للطائرات بدون طيار. ولا يتناول التشريع صراحة الحق في ممر أو مجال جوي للاستخدام التجاري للطائرات بدون طيار والتي ستكون أكثر عرضة لتضخم القضايا القانونية المتعلقة بالتعدي على ممتلكات الغير والإزعاج. نظرًا لأن نشر الطائرات التجارية بدون طيار في ماليزيا لا يزال في مراحله المبكرة، فإن تأثير الطائرات التجارية بدون طيار على الجمهور، وخاصة المسؤولية عن الإهمال، لا يزال غامضًا. تبحث هذه الدراسة القانونية النوعية في القوانين واللوائح التي تحكم الاستخدام التجاري للطائرات بدون طيار في ماليزيا والدول الأخرى لتحديد أفضل الممارسات للتطبيق الماليزي. إنه يستخدم تحليلًا قانونيًا نقديًا وبحثًا وصفيًا للطائرات بدون طيار التجارية. لقد اعتمد هذا البحث على المصادر القانونية الأولية والثانوية مثل التشريعات والقواعد واللوائح والتوجيهات والسوابق القضائية، والكتب، والمجلات الأكاديمية، والصحف. ويرى هذا البحث أنه من أجل الحصول على قانون شامل بشأن الاستخدام التجاري للطائرات بدون طيار، يجب أن توفر القوانين أولاً وتحدد حكمًا صريحًا بشأن الحق في المجال الجوي على ارتفاع منخفض للطائرات بدون طيار لأنها تعتبر البنية التحتية الأكثر أهمية. يتناول هذا البحث القانون الذي يحكم حقوق الارتفاق وتأجير المجال الجوي كطرق بديلة للطائرات بدون طيار التجارية لتحليق في المجال الجوي. ويجادل هذا البحث أيضًا بأن مبدأ المسؤولية الصارمة وخرق الضمان يجب تقييمه بناءً على الواجبات والالتزامات الناشئة عن العقد الذي أبرمه الطرفان. علاوة على ذلك، يراقب هذا البحث تقييم المخاطر، التي تعد العنصر الأساسي في الطائرات التجارية بدون طيار، من خلال قياس إمكانية التنبؤ بالمخاطر لتوفير الأمن والسلامة للجمهور. يعد هذا البحث حيويًا وهامًا لتوضيح أي غموض يحيط بقوانين الطائرات بدون طيار، خاصة فيما يتعلق بحقوق استخدام المجال الجوي للطائرات بدون طيار والمسائل القانونية الأخرى، لتعزيز الطلب على الطائرات بدون طيار التجارية في السوق، والحصول على ثقة الجمهور في استخدام الطائرات بدون طيار التجارية في ماليزيا. يشير هذا البحث إلى أن هيئة الطيران المدني الماليزية (CAAM) يجب أن تكون جاهزة لصياغة لوائح للعمليات المحددة للطائرات بدون طيار التجارية بشكل فردي من أجل فعالية وكفاءة الطائرات بدون طيار التجارية في إدارة المخاطر. كما يجب الإعلان عن المنطقة التي لم يتم المساس بها من المجال الجوي على ارتفاع منخفض

للطائرات التجارية بدون طيار على بعد يتراوح بين 200 و 400 قدم من سطح الأرض للفصل وفقاً
لذلك بين المجال الجوي المعقول للمالك والمجال الجوي الصالح للملاحة للطائرة المأهولة.



APPROVAL PAGE

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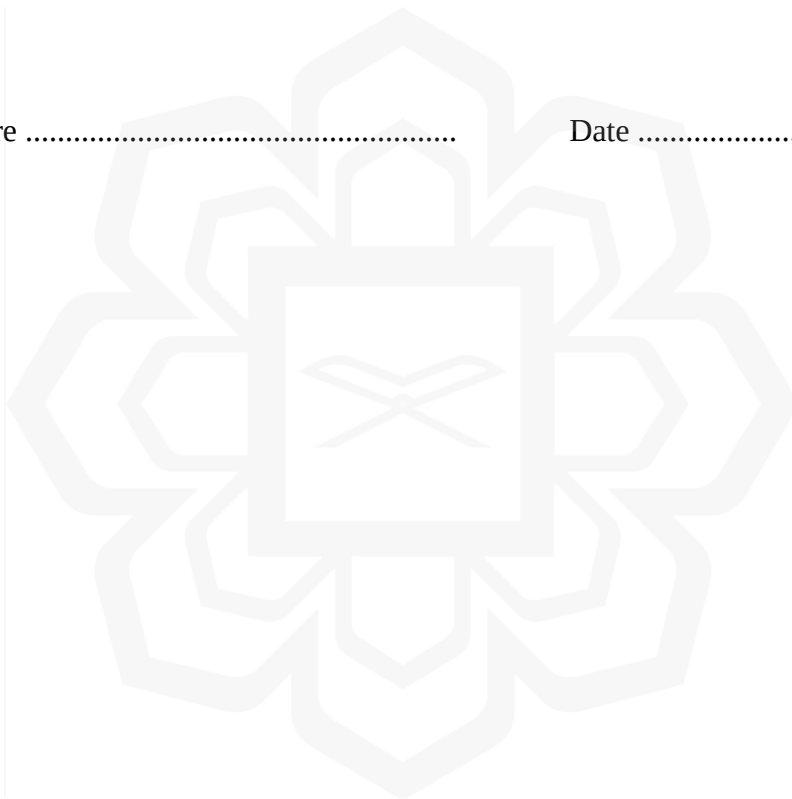
DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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*This thesis is dedicated to my lovely husband, my wonderful son, my late father, my
adored mother and all of my siblings for their endless support, love and
encouragement. May Allah shower them with grace and bless them with Jannahtul
Firdaus.*



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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AMA	Academy of Model Aeronautics
ANC	Air Navigation Commission
ATC	Air Traffic Control
ATS	Air Traffic Control Service
BVLOS	Beyond Visual Line Of Sight
CA	Certifying Agency
CAA	Civil Aviation Act 1969
CAAM	Civil Aviation Authority Malaysia
CAAS	Civil Aviation Authority of Singapore
CAD	Civil Aviation Directive
CAR	Civil Aviation Regulation 2016
CASA	Civil Aviation Safety Authority (Australia)
CBD	Central Business District
CGSO	Chief Government Security Office
CICs	Common Interest Community Setting
CMA	Communications and Multimedia Act 1998
COA	Certificate of Airworthiness
DCA	Department of Civil Aviation
DIY	Do It Yourself
DRZ	Drone and Robotics Zone
DTS	Drone Test Site
EASA	European Union Aviation Safety Agency
ERP	Emergency Response Plan and Recovery Scheme
EU	European Unions
EVLOS	Extended Visual Line Of Sight

FAA	Federal Aviation Administration of the United States of America
FAR	Federal Aviation Regulations
FMAA	FAA Modernization and Reform Act 2012
GCAA	General Civil Aviation Authority (UAE)
GOF	General Operations Force
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rule
ISLM	Integrating Sound Level Metre
ITU	International Telecommunication Union
JKR	Public Works Department
JUPEM	Department of Survey and Mapping Malaysia
KLCC	Kuala Lumpur City Centre
MADA	Muda Agriculture Development Authority
MCMC	Malaysian Communication and Multimedia Commission
MOAs	Military Operations Areas
MQA	Malaysian Accreditation Agency
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
OSHA	Occupational, Safety and Health Administration's (OSHA)
PANS	Air Navigation Services Procedures
PBUH	Peace Be Upon Him
RCAA	Rwanda Civil Aviation Authority
RCoC	Remote Pilot Certificate of Competency
RMP	Royal Malaysia Police
RPA	Remote Piloted Aircraft
RPAS	Remotely Piloted Aircraft System
RPASP	Remotely Piloted Aircraft Systems Panel
SARPs	Standards and Recommended Practices

SFOC	Special Flight Operations Certificate
SIRIM	Standard and Industrial Research Institute of Malaysia
SLM	Sound Level Metre
SLP	Self Labelling Program
SORA	Specific Operations Risk Assessment
SRSP	Standard Radio System Plan
sUAS	Small Unmanned Aircraft Systems
UA	Unmanned Aircraft
UAE	United Arab Emirates
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
UIS	UAS International Standard
UN	United Nations
USA	United States of America
UTM	Unmanned Traffic Management
VFR	Visual Flight Rule
VLOS	Visual Line of Sight

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter highlights the background of the research to see the root cause of the research which led to the problem statement, research objectives and research questions. Furthermore, this chapter provides hypotheses for the development of the research based on the problem research questions and research objectives. In addition, this chapter explains the methodology that the researcher determines to use for the research. The scope and limitations of the study are also highlighted in this chapter to see the extent of the research in relation to the research objectives. The proposed schedule of research also is mentioned in this chapter to view the connection of the duration of the study with the proposed chapters. The significance and contribution of the research also are discussed in this chapter to see the impact and the development of the research in Malaysia. Moreover, this chapter reviews and evaluates the previous studies highlighted by experts and scholars from the various kinds of literature in the various journals to see the future contributions towards the legal issues of the research which can be highlighted in the research for the Malaysian context. Lastly, the chapterisation of the research is stated in this chapter to briefly summarize the discussion and the analysis of the legal issues of this research.

1.2 BACKGROUND OF THE RESEARCH

Technology advances in today's world have proven to be of assistance to mankind in so many aspects. Sometimes, technology like smart robots as a helper, smart watches as telecommunication devices, and others have also taken over some human routines. Such examples demonstrate an irrefutable relationship between humans and digital technology. For Malaysia as one of the world's developing nations, smartphones, vehicles, home appliances, or even drones are never left behind when it comes to the new and trendiest innovations. In Malaysia, the development of new technologies of unmanned aerial vehicles (UAVs) or drones is somehow forcing the government and authorities concerned to embark on and introduce sufficient laws and regulations to cope with the demands of various commercial markets. A drone or UAV is considered an unmanned aircraft or ship that can navigate autonomously, without human control or beyond the line of sight or in detail. The UAV is either remotely controlled by pilots or operators on the ground using a data link or it has pre-programmed flight plans without direct human control.¹ In other words, a UAV is an unmanned aircraft remotely piloted system either pre-programmed or remotely controlled by a pilot on the ground. The concept of manned flying aircraft and unmanned flying aircraft could be similar in terms of the concept of flying in the airspace but it might be different in terms of the capabilities and the extent of its liabilities and thus laws affected by those technologies are varied.

¹ Burkoff, J., "Law Enforcement Use of Drones & Privacy Rights in the United States", *Legal Studies Research Paper Series Working Paper*, no. 2014-34 (2014): 14.

1.2.1 Term related to UAV

Several terms are used in the legal text and the legislation to infer a UAV. Every word shall be defined properly to clarify the ambiguity of the terms used for UAVs. Is a UAV within the ambit of a vehicle or an aircraft? Firstly, the original text of Annex 7 to the Convention on International Civil Aviation (Chicago Convention)² defined ‘aircraft’ as any machine that can derive support in the atmosphere from the reactions of the air.³ In 1967, amendments to Annex 7 included a new definition of aircraft to exclude hovercraft from its scope as any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth’s surface.⁴ Annex 7 indicates, however, that a Remote Piloted Aircraft (RPA) is simply one type of unmanned aircraft, and that all unmanned (pilotless) aircraft, whether remotely piloted, fully autonomous, or combined, are subject to the provisions of Article 8 of the Chicago Convention.⁵

UAV may simply be defined as an aircraft capable of flying independently and autonomously assisted by computers and sensors on board. Secondly, under Regulation 2 of the Civil Aviation Regulation 2016, small unmanned aircraft are referred to as unmanned aircraft systems other than balloons and kites with a weight not exceeding 20 kilograms, except their fuel, including any objects or equipment mounted or attached to the aircraft at the beginning of its flight. On the other hand, small unmanned

² Aircraft Nationality and Registration Marks 1946 (Annex 7 to the Convention on International Civil Aviation), Item 1.

³ Redefining the term “aircraft”, excluded all air cushion vehicles such as hovercraft from the definition of aircraft.

⁴ Aircraft Nationality and Registration Marks 2003 (Annex 7 to the Convention on International Civil Aviation), Item 1. Classification of aircraft is also mentioned in Table 1 of Annex 7. Aircraft is divided into lighter-than-air aircraft and heavier-than-air aircraft.

⁵ ICAO, “Working Paper: Legal Committee – 37th Session Remotely Piloted Aircraft Systems Legal Survey”, 4 to 7 September 2018, <<https://www.icao.int/Meetings/LC37/Documents/LC37%20WP%2021%20EN%20Remotely%20Piloted%20Aircraft.pdf#search=unmanned%20aerial%20vehicles>> (accessed on 2 January 2021).

surveillance aircraft are classified as small unmanned surveillance aircraft that are equipped to perform some form of surveillance or data acquisition. Furthermore, Regulation 2 of the Civil Aviation Regulation 2016 identified aircraft as a machine capable of deriving support from the atmosphere from air reactions, other than air reactions against the earth's surface.

Furthermore, Circular 328 AN/190 Unmanned Aircraft Systems (UAS) and the Manual on Remotely Piloted Aircraft Systems provided the following descriptions that 'unmanned aircraft' (UA) is an aircraft which is intended to operate with no pilot on board; the term of UAS is further defined as an aircraft and its associated elements which are operated with no pilot on board. On the other hand, remotely piloted aircraft (RPA) is an unmanned aircraft which is piloted from a remote pilot station.⁶ A Remotely Piloted Aircraft System (RPAS) is a remotely piloted aircraft associated with a remote pilot station which requires command and control links and any other components as specified in the type design. A distinction exists between UAS and drones, where the UAS is an unmanned aircraft operated by a pilot on the ground. On the other hand, UAVs are usually autonomously piloted by a computer program.⁷ The phrases' UAV, UAS, RPAS, or drones have been used interchangeably to refer to an autonomously controllable lightweight unmanned aircraft.

The term unmanned is referring to without a human or pilot on board. Aerial vehicle on the other hand refers to radio-frequency aircraft. The term Remotely Piloted Vehicle (RPV) was used in the 1960s and replaced in the 1980s by the term UAV. A more recent and common term for an unmanned aircraft is a drone. UAVs were historically referred to as "pilotless aircraft". The term pilotless aircraft also is used in

⁶ ICAO, "Glossary of the Unmanned Aircraft Systems (UAS)", Cir 328/AN 190. (2011).

⁷ Anderson, L.T., "The Sky's The Limit: UAS Regulation and Changing Applications in Agriculture", *Kentucky Journal of Equine, Agriculture, & Natural Resources Law*, 8(2), (2015): 404.

Article 8 of the International Civil Aviation Convention.⁸ The UAV is described as a robotic aircraft without a pilot who flies the aircraft. It may operate with a power source or a control system. The major difference with manned aircraft is that UAVs are operated without a pilot as their physical is typically small and can utilize an electrical propulsion system as their power source.⁹ Today, UAVs reflect the new civil aviation revolution. According to the Federal Aviation Administration of the United States of America (the FAA), an unmanned aircraft is an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.¹⁰

1.2.2 Historical Development of UAV

UAVs have been around the world for many years. The development of UAVs that began during World War II has come a long way for both military and non-military activities. The development of UAVs can be traced back to 1804, when the first flights by a fixed-wing unmanned model were flown by George Cayley in Yorkshire, England.¹¹ In 1849 where the UAVs were used for military purposes when the Austrians attacked the Italian city of Venice using unmanned balloons that were loaded with explosives.¹² Although balloons would not be considered a UAV today, this was a technology the Austrians had been developing for months before, which led to further advancements. In 1883, an Englishman named Douglas Archibald attached an

⁸ Hodgkinson, D., & Johnston, R., “Guiding Principles for Drones: Starting Point for International Regulation”, *Perth International Law Journal*, 3, (2018):158-[ii].

⁹ Smith, A.T., “Airspace Invaders: Commercial Drone Operators' Rights & Event Holders' Civil Claims Against Camera-Equipped Drone Operators”, *Charleston Law Review*, 10(3), (2016): 382.

¹⁰ U.S Department of Transportation Federal Aviation Authority, “Notice 8900.268 Education, Compliance, And Enforcement of Unauthorized Unmanned Aircraft Systems Operators A-1”, (2014), <https://www.faa.gov/documentLibrary/media/Notice/N_8900.268.pdf> (accessed on 17 January 2023).

¹¹ Newcome, L.R., “Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles”, *American Institute of Aeronautics and Astronautics Inc*, (2004):139.

¹² Daly, D., “A Not-So-Short History of Unmanned Aerial Vehicles (UAV)”, <<https://consortiq.com/media-centre/blog/short-history-unmanned-aerial-vehicles-uavs>> (accessed 6 February 2024).

anemometer to the line of a kite to measure wind velocity at altitudes up to 1,200 feet. Further in 1887, he attached cameras to the kites providing one of the first exploration UAVs and took hundreds of photographs from kites during the Spanish-American war.¹³ Unmanned aviation was somehow invented in the same year as manned aviation.¹⁴ The earlier pioneers of aircraft including Orville Wright and Glen Curtis had contributed to developing both technologies.¹⁵ UAVs were flying before the Wright Brother's first flight in 1903. In the same year, the Wright Brothers made the history of their first aircraft, Kitty Hawk, German Carl Jatho pushed his unmanned biplane out to a distance of almost 200 feet.¹⁶ The development of both manned and unmanned aircraft diverged rapidly following World War I for various purposes.¹⁷ In 1915, the British military used aerial photography to their advantage in the Battle of Neuve Chapelle.¹⁸ They were able to capture more than 1,500 sky view maps of the German trench defences in the region. Later during World War II, there were several unmanned aircraft were modified to carry bombing missions.

In China 2000 years ago on the other hand had used kites for carrying explosives by a warlord to assault the walled city of his enemies. Steam-propelled 'pigeon' that flew 200 meters was designed to indicate the initial stage of the development of UAVs.¹⁹ The concept of UAV in previous years was not like what we have today in terms of the size that as big as an aircraft. The technology of UAVs that we have today

¹³ Fahlstrom, P.G., & Gleason, T.J., *Introduction to UAV System*, (Columbia: UAV System Inc, 2005):1.

¹⁴ Newcome, "Unmanned Aviation: A Brief History of Unmanned Aerial Vehicles", 15.

¹⁵ Ibid.

¹⁶ Holder, B., & Holder, W.G., *Unmanned Air Vehicle an Illustrated Study of UAVs*, (Atglen, PA: Schiffer Publishing Ltd, 2001), 11.

¹⁷ Newcome, 15.

¹⁸ It took place in the First World War in the region of northern France. The Battle was planned by the British Army. The village of Neuve Chapelle was considered the weak point of Germany. The battle began in the early hours of 10th March 1915. This was the year of the development of aerial reconnaissance techniques for photographing enemy positions from the sky.

¹⁹ Hodgkinson, & Johnston, "Guiding Principles for Drones: Starting Point for International Regulation", 158.

is lighter, smaller, and faster than that we had before. The fact that technology advances faster and further than law is a plain truth. A quick analysis of the history of technological growth reveals that the development of legal frameworks is often outperformed by technical advances. The development of mobile technology also plays an important part in the development of UAVs. Today's smartphone enables UAVs to know their coordination and direction of motion and travel. Smartphones themselves can serve as remote controls for UAVs that are readily accessible. It has been increasingly worldwide accepted in an extremely rapid way for a range of private, civil, and commercial purposes and leads to the economic growth of the country.

1.2.3 UAV in Malaysia

Every year the prospects for UAVs and their capability are growing. In light of new technologies, this also forces the fundamental principles to be re-examined. For instance, developments in the field of UAVs have in recent years created a series of noted legal debates and amendments to the laws and policies in Malaysia. There are indeed safety, protection, and security issues with these advancements and the use of UAVs. In the context of UAVs in Malaysia, the challenge is when the government and authorities have yet to embark on and implement appropriate and effective laws and regulations, the infrastructures as well as the safety guidelines for the operation of UAVs for commercial purposes. The Civil Aviation Authority of Malaysia (CAAM), which comes under the Ministry of Transportation's portfolio, is the responsible regulatory body for both manned and unmanned aircraft. Malaysia has shown a slow development in the laws of UAVs despite abiding by rules under the International Civil Aviation Convention (the Chicago Convention). Although it was ratified back on 7 April 1958 to uniform the international standard for civil aviation that covers both

manned and unmanned aircraft, the progress of regulations of UAVs is still dull due to the vagueness in the application of laws connected with commercial UAVs. Malaysia as a signatory of the Chicago Convention since 1958 is still developing the laws on UAVs according to the international standard approved by the International Civil Aviation Organization (ICAO). The ICAO is a United Nations (UN) specialized agency, established by States in 1944 to manage the administration and governance of the Convention on International Civil Aviation (the Chicago Convention). This ICAO works on International Civil Aviation Standards and Recommended Practices (SARPs) and policies in support of a safe, efficient, secure, economically sustainable, and environmentally responsible civil aviation sector both for manned and unmanned aircraft.

Despite the vagueness of regulations, the adaptation of UAVs in Malaysian society is seen to be optimistic since UAVs are widely used and accepted for private use, aerial works and surveillance purposes. Nevertheless, the operation of UAVs in the commercial arena is seen to be restricted due to the vagueness of laws. In 2015, for example, Malaysia faced a UAV user who posted several images of aircraft approaching the KLIA runway in Sepang, prompting the Royal Malaysia Police to begin deploying anti-drone guns capable of disconnecting drones from a distance of up to one kilometre. The devices were also seen deployed in many ceremonies attended by Yang di-Pertuan Agong (YDPA), for example during the exhibition of Langkawi International Maritime and Aerospace (LIMA), football matches, YDPA's coronation, and other national events. In Malaysia, UAVs are being used to gather information rather than for illegal purposes. Further, the trend and acceptance of UAVs began relatively late in Malaysia. It began in 2016, when the public began to use it for sports and recreation, particularly

for photography and videography, and some of them made it a new hobby that is mainly for personal and private use.

Gradually in Malaysia, the operations of UAVs are extended not only for private purposes but also for commercial aerial work that includes surveying, mapping and contouring areas, and site inspection, which is normally carried out by the site engineer.²⁰ Apart from that, the PLUS highway might start to use the recent technology of UAVs to assist highway users in the early detection of dangers and impediments on the highway.²¹ UAVs are easier, cheaper, faster, more accurate, and more effective than the use of existing types of machinery such as patrol cars or helicopters and others like those used today. In addition, the operation of UAVs in agriculture also leads to more sustainable farming and reduced dependence on manual labour, especially in fertilizer spreading and spraying. More and more farmers have opted to use UAVs in farming management. In 2017, the Muda Agriculture Development Authority (MADA) Paddy Farmers Action Body requested from CAAM, a decision to use UAVs for aerial pesticides in paddy fields.²²

In addition, on 18 June 2019, a Malaysian businessman, a local company that has been involved in the UAV industry since 2014, tried and proposed to use the UAV to deliver food in Cyberjaya.²³ But this project is only at the trial stage. Bear in mind that, this company must adhere to the regulations on UAVs in Malaysia, which is

²⁰ *Persatuan Hainan Selangor dan Wilayah Persekutuan v Datuk Bandar Kuala Lumpur* [2018] MLJU 1498 (HC), an officer from DBKL had used drones for a site inspection by and video taken using UAV, reveals that a big-scale earthworks and slope cutting has been carried out by the applicant. The video taken by drone was adduced as evidence in the court.

²¹ *Khairul Nizam bin Omar v Projek Lebuhraya Usahasama Berhad* [2019] MLJU 530 (MC). This suggestion also was stated in the High Court case of *LBS Travel Sdn Bhd dan Satu Lagi v Nathan a/l Muthayah dan lain-lain* [2019] 8 MLJ 767(HC).

²² Embun Majid, "Paddy Farmers Say No to Drones in Paddy Cultivation", *New Straits Times*, 2 March 2017, <https://www.nst.com.my/news/2017/03/224225/paddy-farmers-say-no-drones-paddy-cultivation>.

²³ Bernama, "Food Delivery via Drones in Cyberjaya by End of the Month", *New Straits Times*, 18 June 2019, <https://www.nst.com.my/lifestyle/bots/2019/06/497157/food-delivery-drones-cyberjaya-end-month>.

subjected to Regulation 140(3) of the Civil Aviation Regulations 2016, P.U. (A) 97 where the regulation prohibits any animal or article attached to the UAVs. This regulation surely must meet the needs of society therefore it could be amended and repealed to suit society's needs. Even during the Movement Control Order of COVID-19 in Malaysia, some people suggested using UAVs for delivering food and other needs, particularly in the areas of the red zone to minimize direct contact with people and thus to practice social distancing.

Furthermore, one initiative from Iskandar Investment Berhad (IIB) has introduced a Drone Test Site (DTS) creating the Drone and Robotics Zone Iskandar (DRZ Iskandar) as the largest research and development of UAVs in Southeast Asia. This initiative has opened a wide opportunity for commercial UAVs to grow and meet the demands of society. By 2025, it is anticipated that DRZ Iskandar will attract RM351 million in investments and create 1,000 high-paying employment opportunities in robotics and drones. The growth of the DTS will also boost the regional economy, aiding entrepreneurs and communities nearby. This robotic and UAV ecosystem has invited more investors for the advancement of commercial UAVs. DHL Express, SG Akademi (M) Sdn. Bhd., Garuda Robotics (M) Sdn. Bhd., and Alphaswift Industries Sdn Bhd. are already in operation at DRZ Iskandar.²⁴

Moreover, UAVs can serve many other purposes besides photography, such as marketing or mailing. American online trading giant company, Amazon, is working on “Prime Air”, where UAVs can deliver courier services.²⁵ Google also is working on a

²⁴ The i-Property.com.my News team, “DRZ Iskandar to Bring in RM351 Million in Investments, Create 1,000 Jobs by 2025”, *i-Property*, 21 January 2022, <https://www.iproperty.com.my/news/drz-iskandar-to-bring-in-rm351-million-in-investments-create-1000-jobs-by-2025-75110>.

²⁵ Amazon Staff, “Amazon Prime Air Prepares for Drone Deliveries”, *Amazon*, 13 June 2023, <https://www.aboutamazon.com/news/transportation/amazon-prime-air-prepares-for-drone-deliveries>.

similar project for commercial UAVs. Facebook²⁶, on the other hand, focuses its research on developing a UAV called Aquila, powered by solar energy. This energy source would allow the machine to fly continuously and without interruption, lasting up to several months.²⁷ Britain Tesco, Walmart, and Amazon also had started and initiated a trial on delivery of goods using the UAV during the pandemic of Covid-19.

Besides that, mass media also has started to use UAVs for aerial photography and newsgathering by allowing the journalist to take footage and news from the sky, especially news events on natural disasters, war, riots, and so on unlike using the conventional method of using a helicopter. Moreover, in the entertainment arena, many filmmakers have also used UAVs to get the best cinematography. UAVs are considered a must-have tool in cinematography.

The rigidity of UAV regulations in Malaysia is when it stated the generality of operation of UAVs limited to the purpose of aerial work. The absence of a provision for a right to use airspace for commercial UAVs is one of the weaknesses in Malaysian law. The airspace for UAVs in general seats in the middle and in between the navigable airspace of manned aircraft and the reasonable airspace of the proprietor of the land. The navigable airspace of manned aircraft is set as customary international law at a minimum of 500 feet from the surface of the land. Thus, any other flying object is prohibited from encroaching on the navigable airspace of manned aircraft. Due to that, the ICAO currently has set the maximum altitude for UAVs to fly at 400 feet from the surface of the land. Since none of the provisions explicitly mentioned the minimum altitude for the UAVs to fly in the airspace, it is hardly possible for commercial UAVs

²⁶ See the press release from the Facebook founder and CEO, Mark Zuckerberg: “The Technology Behind Aquila”, issued on 21 July 2016 via the author’s profile on facebook.com.

²⁷ Tobór, D *et al.*, “Legal Aspects of Air Transport Safety and the Use of Drones”, *Scientific Journal of Silesian University of Technology*, Series Transport, 97 (2017): 170.

to operate and meet the demand of the economy. The ownership of airspace is indeed subject to the *ad coelum* principle of reasonable airspace of the proprietor. Therefore, this leads to the other issue of trespass to airspace and the concept of navigability. Alternatively, other land dealings may appropriately be introduced to realise the exact altitude of navigable airspace for the UAVs. Indeed, the verification of navigable airspace for UAVs will take time and years. Nevertheless, the flexibility of laws surely can offer other alternative methods to realise the operation of commercial UAVs.

The concept of UAVs that can fly and encroach on the airspace and land of individuals may give another legal implication as to the trespass of land. UAVs have varied functions according to their size. The average limit for UAVs to fly is between the range of 100-7000 meters with camera megapixels between 12mp-20mp and video megapixels from 2.1mp-8.8mp. The subject of the issue of trespass to land can be highlighted here by looking at the definition of trespass itself. The definition of trespass under the head of 'Wrongs to Property'²⁸ says:

“Every unlawful entry by one person on land in the possession of another is a trespass for which an action lies, even though no actual damage is done. A person trespasses upon the land if he wrongfully sets foot on it, rides or drives over it takes possession of it, or expels the person in possession, or pulls down or destroys anything permanently fixed to it, or wrongfully takes minerals from it, or places or fixes anything on it or in it, or if he erects or suffers to continue on his land anything which invades the airspace of another, or if he discharges water upon another's land or sends filth or any injurious substance which has been collected by him on his own onto another's land.”²⁹

Any person or body to whom land has been alienated, reserved land has been leased or temporary occupation license has been granted in respect of any land shall be

²⁸ *Halsbury's laws of England*, 4th ed., vol. 45. (Lexis Nexis, 1999), United Kingdom, 63.

²⁹ *Ibid.*

entitled to the exclusive use and enjoyment of so much of the column of airspace above the surface of the land, and so much of the land below that surface, as is reasonably necessary to the lawful use and enjoyment of the land.³⁰

In clear terms, the law clearly grants a person the right to enjoyment of his land which also includes the right to airspace. The law prohibits unjustifiable interference with the possession of one's land. A person has the right to the exclusive enjoyment of so much of the column of airspace above the surface of his and as is reasonably necessary to the lawful use and enjoyment of the land.³¹ Flying UAVs within the boundary of a person's airspace will amount to encroachment of his right to the airspace. Any regulations relating to the UAV must address this issue, hence avoiding any lacuna in the law. It is crucial to explore the avenues where the flying UAV will not lead to unjustifiable interference of individual airspace to avoid the tort of trespass to land and to evade issues relating to nuisance where the UAV is used in public areas,

Furthermore, an operator of UAVs can be liable for accidents arising from the use of UAVs. UAVs could easily accelerate up to 70 kilometres per hour (kph) and crash into a building or person, causing serious damage even if they weighed only a few kilograms.³² Although death may be rare, bodily injury can be very serious. The introduction of "do it yourself" (DIY) UAVs is also another aspect that regulators should be aware of the further impact in terms of the safety issue, or perhaps to provide punitive measures for non-compliance with the safety guidelines. In the United Kingdom, on the other hand, the UAV regulation has highlighted the questions of human rights and tortious liability. It is best to highlight the UK Drone and Model

³⁰ *Karuppannan v Balakrishnen (Chong Lee Chin & Ors., third parties* [1994] 3 MLJ 584 (FC).

³¹ *Spektra Segmen Sdn Bhd v TC Autoworld Sdn Bhd* [2018] MLJU 819 (HC), para 8.

³² Qishin Tariq, "Drones Get Dangerous", *The Star*, 29 January 2018, <https://www.thestar.com.my/tech/tech-news/2018/01/29/drones-get-dangerous/>.

Aircraft Code; for example, point 16 mentions that you must ensure that you are fit to fly UAVs.³³ The principle of negligence, drinking while driving is adopted in point 16 of the Code where you should not fly under the influence of drugs or medicines as it may affect your judgments and ability to think wisely when flying the UAVs. Point 19 of the code also highlights an interesting point like the compulsory requirement to have insurance while flying the UAV. Furthermore, if the UAVs are being used for recreational reasons, the operator should consider third-party insurance; otherwise, the operator may be held personally accountable for any injury or damage caused while flying the UAVs. The issue of insurability is absent in Malaysian UAV law. The regulations for UAVs are important in providing a legal basis for acceptable operation in the national airspace by determining liabilities of parties in case of accidents, insurability and so on to have standardised regulations for both civil and military markets.³⁴

Another legal implication arising from the use of UAVs is the commission of nuisance. As such, currently, there are specific regulations which aim at avoiding nuisance. The policy set by CAAM, for instance, prohibits UAV operators from flying them within 5 kilometres radius of any airport space. In addition to the above, for security purposes, several locations in Malaysia have been declared as no-fly zones, such as Putrajaya, Kuala Lumpur City Centre (KLCC), the Parliament, and Istana Negara. Any other location within government offices that is not open to the public can also be considered as a no-fly zone, these include police stations, prisons, government offices, and military bases.³⁵ By providing a no-fly zone, the commission of tort of

³³ Drone and Model Aircraft Code 2023 (UK), point 16.

³⁴ Newcome, 137.

³⁵ *Drone Academy Asia*, “Drone Laws and Regulations in Malaysia”, 15 February 2023, <<https://www.droneacademy-asia.com/post/drone-laws-and-regulations-in-malaysia>> (accessed 6 February 2024).

nuisance can be reduced. The safety and security of the public is a paramount consideration and as such the policy and directives on the use of UAVs must spell out evidently the boundaries within which UAVs are allowed to operate. The public who are affected by the noise and vibration of flying UAVs may also bring an action under the law of nuisance. Hence, it is time to determine the limitations in the use of airspace to avoid litigations in private and public nuisances.

In conclusion, although the introduction of UAV laws in Malaysia is not extensive, the legislators must see beyond the reality of the capabilities of UAVs in almost all aspects. The acceptance of this new technology of UAVs in Malaysia is undeniable. Therefore, the Malaysian government, legislators, and other relevant authorities especially the Civil Aviation Authority should provide a set of comprehensive laws on UAVs. The new law shall be suited to the changing lifestyle and society in Malaysia.

There is a possibility that Malaysia will transplant laws in the USA, Canada, Rwanda or South Africa on the commercial use of UAVs. A well-structured integrated legal framework and cooperation from all agencies in providing and promoting commercial use of UAVs and at the same time protecting the public from any implication from the usage are crucial for the sustainability and growth of the Malaysian economy. New legislation must be enacted to specifically address these issues and implications.

Implications of UAVs for commercial use are essential to be evaluated as they somehow will affect the question of law. Introducing new technology without taking into consideration the impact on humans is a great failure and may give rise to legal issues. The preparedness of the respected authority in giving and providing a comprehensive law on UAVs is vital. The respected authority especially the Civil

Aviation Authority of Malaysia must be ready to predict the future usage of UAVs and change the lifestyle of society towards the usage of UAVs. The new normal of humans all over the world has changed because of the pandemic of COVID-19.

From another perspective, Malaysia could also need to improve the legal framework for the operation of UAVs for commercial and business purposes for example for delivering documents, packages, or even food and beverages since this new area is expanding to meet the needs of society. Due to the ongoing social distancing practice, in Malaysia and across the world UAVs use could be a new and the best to deliver packages. Many companies are willing to opt for this new method of delivery of goods. However, the law regarding the operation of UAVs as contained in our current subsidiary legislation prohibits any article or animal from being attached to the UAVs, deterring the opportunity for the use of UAV technology for commercial purposes. There is a dire need to update the law, with a framework suitable to support and accommodate the enhancement of technology in current dealings.

1.3 PROBLEM STATEMENTS

1. There is ambiguity in establishing the legal positions and criteria for the commercial use of UAVs, which is not adequately underlined in the UAV law resulting in a foul-up of what constitutes commercial.
2. The overlapping jurisdictions of the Federal and the States in encountering matters related to the right to use airspace for commercial use of UAVs in Malaysia create discrepancies in the administration of UAVs.
3. The unavailable infrastructure of the right to use airspace for UAVs creates a contentious claim by the proprietor over *ad coelum* airspace.

4. The safety measures in dealing with the implications of risks associated with the commercial use of UAVs are not adequately highlighted in the regulation, causing concern among the public.

1.4 RESEARCH QUESTIONS

1. What constitutes the commercial use of UAVs and what is the legal position?
2. What are the jurisdictions of the Federal and the States over the right to use airspace for commercial UAVs in Malaysia?
3. To what extent the rights to airspace is accorded to the commercial use of UAVs?
4. What are the interference and implications that may arise from the commercial use of UAVs that may impact the public?

1.5 OBJECTIVES OF THE RESEARCH

1. To discuss the legal position in the commercial use of UAVs.
2. To analyse the jurisdictions of the Federal and the States for the right to use airspace for commercial UAVs as enumerated in the Federal Constitution.
3. To evaluate the extent of the right of airspace in the commercial use of UAVs in Malaysia and other available laws, regulations, and policies on UAVs in the selected Countries and at the International level.
4. To analyse the legal implications and liabilities of interested parties of the commercial use of UAVs based on the classes of risk to the public.

1.6 HYPOTHESIS

1. The commercial use of UAVs can be realized for all sectors of the economy if the segregation of airspace and the navigable airspace for UAVs is properly defined by the CAAM for the sustainable economic growth and technological advancement of Malaysia.
2. The legal implications arising from the use of UAVs can be determined if the laws and regulations can define the rights and liabilities of the operators of UAVs based on the commercial agreements that they enter into.

1.7 SCOPE AND LIMITATION OF THE STUDY

This research is confined to reviewing and analysing the existing comprehensive UAV law as set out in the Chicago Convention and the other selected countries for the perspective of Malaysian law. Nowadays, people can put up with UAV operations in a range of settings, from private to commercial. This research covers the study and analysis of the commercial use of UAVs in Malaysia as a result of the recent surge in the UAV industry growth, which represents a plethora of opportunities in commercial industries such as logistics, agriculture, conservation, oil and gas, entertainment, real estate, marketing, and many more. Therefore, the scope of this research is only covered and confined to the discussion on the regulations and the implications of the commercial use of UAVs to the public.

For this research, Rwanda, South Africa, Canada and the United States of America, have been chosen to be referred since these countries advanced in framing legislation on UAVs and already have a set of comprehensive laws as to the operation of UAV as compared to Malaysia, which has addressed basic issues and the question of

laws. Further, Singapore has been chosen to be a reference in this research law due to the geographical aspect, its advancement in using UAVs, and the possibility of having cross-border UAVs with Malaysia.

The discussion shall also look into international law particularly the International Convention on Civil Aviation (the Chicago Convention) and European Union Aviation Safety Agency (EASA) to affect this research. It should be noted that any suggestions or way forward that the researcher proposes shall be based on Malaysia's current legal framework and the law as it stands in today's research and is limited to legal measures only.

However, the limitation of this research is confined to the availability of UAV law generally for commercial operation and not extended to private use and law enforcement. The laws on UAVs for law enforcement are different from commercial use and thus could not be discussed in this thesis as one integrated research. Therefore, the discussion and analysis of the implications of UAVs and their usage by private use and law enforcement are not covered in this research.

1.8 RESEARCH METHODOLOGY

This research is a qualitative legal study and adopts the method of doctrinal research. This research was developed through a library-based research methodology. It employed descriptive study, critical legal analysis and application of laws relating to the operation of commercial use of UAVs in Malaysia.

To collect information and data on the research topic, the sources include primary and secondary legal sources. The method of content analysis adopted in analysing the primary sources of law which comprise statutes, rules, regulations, and

case laws UAVs in Malaysia, the United States of America, Rwanda, and other countries. Secondary sources on the other hand, such as books, academic journals, and newspaper articles relating to the operation of UAVs will also be used in extracting the information. To enhance the thesis, the information collected through unpublished materials such as government proceedings, seminar papers and research papers relating to the legal implications of UAVs. Hence, the materials and data collected through online databases such as Hein Online, Lexis Advance Malaysia, JSTOR, ACADEMIA and other online tools in the library.

The investigation of the conceptualization of certain key points such as UAVs, drones, commercial, operator, pilot, owner, manufacturer, airspace, negligence, trespass, and nuisance to adopt the method of descriptive assessment. This method is primarily concerned with finding out "what is," and shall be based on previous discoveries as to the description, explanation, and clarification of such terms. The conceptual framework that interrelated to the finding of the empirical concept based on the established principles and doctrine.

Due to the insufficient UAV law in Malaysia, an interview was conducted with the officer of CAAM, the responsible body for the administration of aviation both manned and unmanned aircraft. This interview was conducted to gain clarity over the future UAV laws in Malaysia, to gain a better picture of the role of UAVs in the commercial arena and to explore the current laws and the possibilities of amending the laws of UAVs to suit commercial usage. The unstructured interview which took place in CAAM's principal office in Putrajaya, provided insight overview of the CAAM's missions and objectives in drafting UAV laws to meet public demand and to uphold the mission of the Chicago Convention. The data collected from the unstructured interview were essential to the qualitative legal research to understand and explore the real

administration of UAV law in Malaysia. The information gathered through the interview gave an actual perception of the role of CAAM in drafting regulations and directives of UAV law. As of the time of the interview, the CAAM closely monitored the development of UAV laws from the European Union Aviation Safety Agency (EASA) and successfully implemented the UAV regulations in the European region. The selected best practices by the EASA were carefully identified in drafting UAV law in Malaysia. A sampling from the consumers cannot be conducted in this research as the legal foundations and laws for commercial UAVs were insufficient, not being enforced, immature and unavailable for the public at the time of this research due to the emergency of COVID-19 in Malaysia.

To strengthen the thesis, the explanatory method was used in referring to the availability of UAV laws in the United States of America, Canada, South Africa and Rwanda since they have successfully enforced their laws on UAVs. The discussion also involved relevant international legal instruments in the effort to enhance the broad range of the operation of UAVs, the uniformity of laws, and the possibility of an international-level to have cross-border UAVs law.

A critical analysis is essential in major parts of this research, especially in examining the adequacy of Malaysian law in coping with the legal implications of the operation of UAVs especially for the commercial use of UAVs. An inductive analysis and content analysis were adopted in this research as a systematic approach to qualitative research in drawing the findings to the research gap. This method is important to discover the lacuna and the grey areas of laws which shall be improvised by further legal interference from the legislators and the policymaker. It deals with the speed and scale of legal or regulatory change, engaging with the interdisciplinary nature

of the subject, addressing the heavy reliance on implications to the public, and how the authorities tackle the nature of the subject.

1.9 SIGNIFICANCE AND CONTRIBUTION

The significance of this research is to study the regulation of commercial use of UAVs in Malaysia by analysing the International Convention on Civil Aviation and other available laws and regulations in the selected countries especially on the implication to the society in terms of negligence, trespass and nuisance. This research is significantly beneficial for the public especially the wide range of adoption and usage of operation of UAVs in many sectors such as business and economics, and even for commercial agriculture. The pandemic of Covid-19 has changed the new normal of society all over the world therefore the usage of UAVs in combating Covid-19 and practising social distancing is essential.

Consequently, this research analyses the implication of the usage of UAVs in the Malaysian community, and subsequently can create uniformity of UAV law as a part of the branch in civil aviation in Malaysia and subsequently may contribute to the growth of the Malaysian economy and uphold the Islamic principle of public interest (*maslahah*). The usage of UAVs is becoming wider than we have now, therefore, a comprehensive law on UAVs is needed especially for commercial use in Malaysia.

This research is vital and significant for clarifying any ambiguity of laws, especially the rights to airspace to increase the demand for UAVs in the market due to COVID-19. Furthermore, this research addresses the key issue in land law and airspace law concerning the proper altitude range for UAVs to fly in the airspace. As a result, this research may help to settle the right of way for commercial UAVs without invading

manned aircraft's navigable airspace or the proprietor's airspace. Furthermore, this research also evaluates the liability of important parties in the operations of UAVs which may emerge based on contracts or can arise from the concept of neighbourhood principles. The risk assessments by measuring the foreseeability of risk for the different categories of UAVs are vital for the growth of commercial UAVs in Malaysia and subsequently can offer safety, security and public confidence for the usage of commercial UAVs.

1.10 SCHEDULE OF ACTIVITIES

This research was conducted within six semesters equivalent to three years of the academic calendar of the International Islamic University of Malaysia (IIUM). The researcher intensively collected and read all the primary and secondary sources including online databases from the library to gain backbone knowledge for the development of the proposed research. The research proposal was prepared for submission to the Ahmad Ibrahim Kulliyah of Laws for approval. After the approval, the researcher carried out an analysis and started to write up the proposed research. Table 1.1 provides the schedule as per the chapter as follows:

Table 1.1 Schedule of Activities

	CHAPTER	DATE OF COMMENCEMENT
1.	Chapter One	Semester 2, 2019/2020
2.	Chapter Two Fieldwork: Civil Aviation Authority of Malaysia.	Semester 1, 2020/2021
3.	Chapter Three	Semester 2, 2020/2021
4.	Chapter Four	Semester 1, 2021/2022
5.	Chapter Five	Semester 2, 2021/2022
6	Chapter Six	Semester 1, 2022/2023

1.11 RESEARCH FRAMEWORK

In brief, this research adopts doctrinal legal research which analyses the laws and regulations affecting the commercial use of UAVs in Malaysia. All the research objectives and research questions are being evaluated conclusively in the respective chapters based on the hypotheses and problem statements of the research. Figure 1.1 is a flowchart of this research framework, as follows:

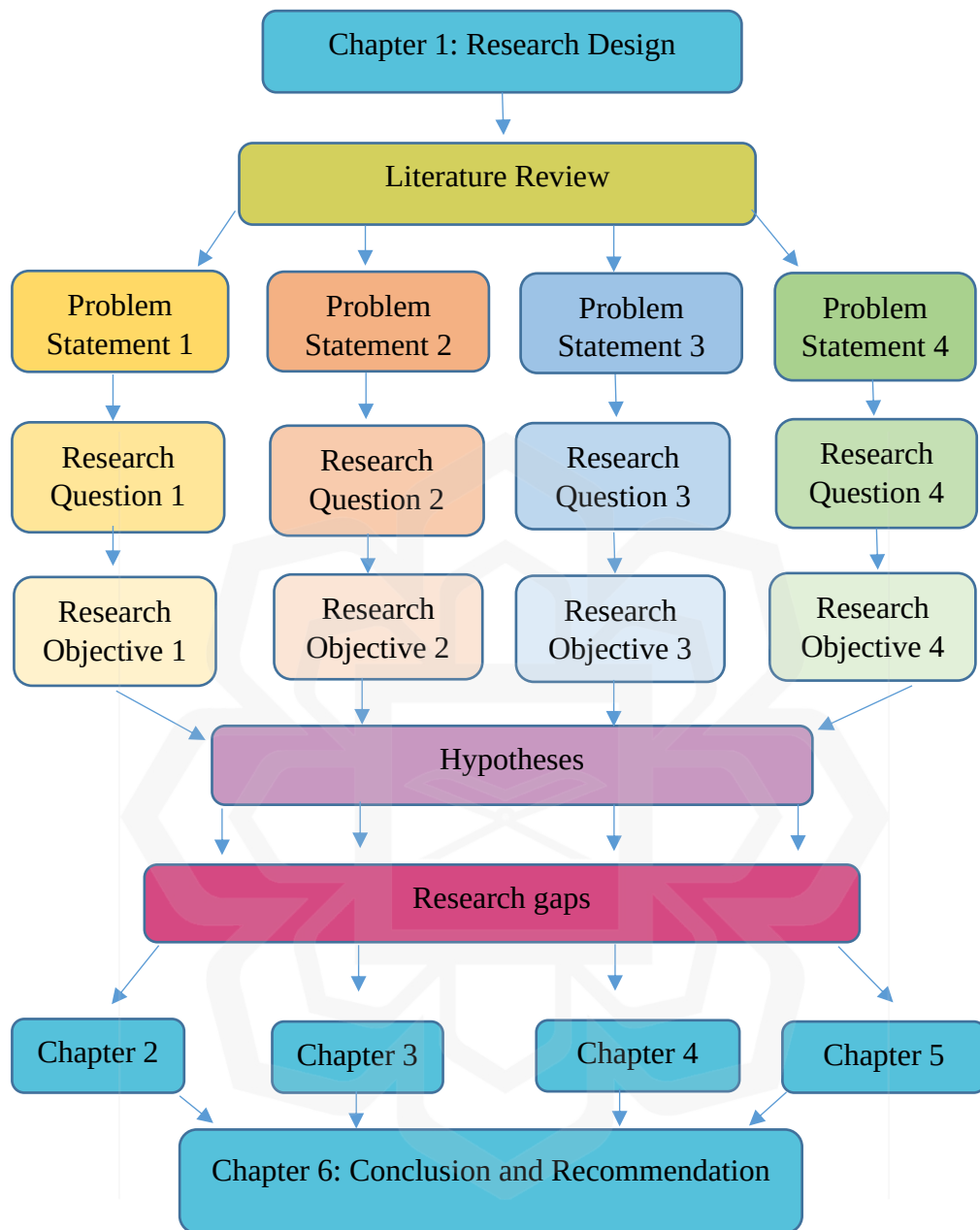


Figure 1.1 Flowchart of Research Framework.

1.12 LITERATURE REVIEW

Numerous materials touch on the issue of the rights and the implications of the commercial use of UAVs. There are several exclusive writings on UAVs from the legal perspectives in Malaysia. Moreover, there are a lot of academic writings on this matter from other countries, especially the United States of America, Singapore, South Africa, and others. Due to the scarcity of literature on these topics in Malaysia, this research embarks to contribute to the existing literature on the legal framework of Malaysia by referring to various articles written by scholars from other successful countries to see the possibility of adopting and convergence their laws on the commercial use of UAVs.

Syed Agha Hassnain Mohsan *et al.*, (2023)³⁶ overview the UAV technology in terms of types, swarms, configurations, standardizations and charging techniques to provide a comprehensive review of the challenges and security issues. Further, the authors mentioned several characteristics of UAVs in terms of flight mode, speeding and capacity of payloads. The authors also are developing software and novel methods and algorithms to address problem-solving tasks.³⁷ The authors further argued that the critical challenge of UAVs is to ensure the security of sensitive data and the risks of being hijacked.³⁸ Furthermore, there is an urgent need for regulatory authorities to develop standardisations for the operation of UAVs in different countries' geographic areas.³⁹ This article provides a comprehensive knowledge and understanding of the technical aspects of UAVs thus the researcher can understand the nature of risks

³⁶ Syed Agha Hassnain Mohsan *et al.*, "Unmanned Aerial Vehicles (UAVs): Practical Aspects, Applications, Open Challenges, Security Issues, And Future Trends", *Intelligent Service Robotics*, 16, (2023): 109–137.

³⁷ *Ibid.*, 114.

³⁸ *Ibid.*, 127.

³⁹ *Ibid.*

connected with different types of UAVs when dealing with the issue of negligence. The researcher agreed with the authors' argument on the standardisations of laws and regulations for UAVs to have a uniform law to avoid confusion in the application of laws.

Furthermore, Habibi *et al.*, (2023)⁴⁰ viewed the management of risk assessment through the application of Specific Operations Risk Assessment (SORA) which was proposed by the European Union Aviation Safety Agency (EASA) in which the applicant shall follow ten steps of the procedure for the risk assessment before the operation of the UAV to mitigate the risks. The researcher examined the effectiveness of SORA in mitigating the risk which may reduce the issue of negligence which may be caused by the UAVs, especially the commercial UAVs which usually carry heavier payloads than the normal operation of UAVs.

Al-Dosari *et al.*, (2023)⁴¹ observed the extent of system security and safety of the civilian UAVs from different types of operation. Further, the authors suggested a comprehensive summary of security is an essential type of security that UAVs should equip for different types of missions. Besides, this article provided complete information for the researcher to find out the different types and operations of commercial UAVs that require different types of security and thus can recommend effective solutions in the assessment of risks.

The controversial debate on the low-altitude airspace and the proprietor's airspace also was discussed by Watson in 2020,⁴² he argued the urgency in declaring

⁴⁰ Habibi, H *et al.*, "On SORA for High-Risk UAV Operations under New EU Regulations: Perspectives for Automated Approach", *arXiv preprint arXiv*, (2023):2303.02053.

⁴¹ Al-Dosari *et al.*, "Systematic Review on Civilian Drones in Safety and Security Applications", *Drones*, 7(3), (2023): 210.

⁴² Watson, T., "Maximizing the Value of America's Newest Resource, Low-Altitude Airspace: An Economic Analysis of Aerial Trespass and Drones", *Indiana Law Journal*, 95(4), (2020): 1399-1435.

low-altitude airspace as navigable airspace thus the conflict between the proprietor's airspace may be resolved and consequently the operator would not drown in the issue of aerial trespass. Hence, in cases of aerial trespass, an aircraft's flight in the airspace above another person's land is considered a trespass if, and only if, (a) it traverses near the airspace next to the land, and (b) it materially impairs the other person's use and enjoyment of his land.⁴³ It further argued that the laws crafted for the manned aircraft were not designed adequately as uniform laws for other flying aircraft which include UAVs. The article analysed that laws should clarify the need for UAVs to fly in low-altitude airspace adjacent to the proprietor's airspace. There shall be a mutually beneficial agreement between the UAV operator and the proprietor of land in flexing the operation of UAVs in low-altitude airspace.

Norhusna Emirah Onn *et al.*, (2022)⁴⁴ analysed the possibility of expansion of commercial UAVs in shipping and delivery can be realised when the regulations offer sufficient infrastructure in terms of a right to use low-altitude airspace similar to the manned aircraft by referring to the doctrine of navigability of airspace. Apart from that, the article critically evaluated the doctrine of navigability which has the value of commercialisation by comparing it to the navigability of water. Further, the authors suggested that the declaration of navigable airspace for the UAVs would change the topography of the ownership of airspace to the federal airspace. The segregation of airspace is the most essential element to define the exact line of airspace for commercial UAVs. If the right of airspace for the UAVs is far from realised, the authors gave suggestions to use alternative and available methods to have a passage and way for the

⁴³ Watson, 1403.

⁴⁴ Norhusna Emirah Onn *et al.*, "The Legal Perspectives of the Doctrine of Navigability of Airspace for Commercial Unmanned Aerial Vehicles (UAVs) In Shipping and Delivery", *International Journal of Law, Government and Communication*, 7 (29), (2022): 673-688.

commercial UAVs which are by application for easement and leasing the airspace. The article also mentions the safety requirements available in CAAM directives for commercial UAVs, especially in shipping and delivery where the operation usually requires an extended visual line of sight (EVLOS). The researcher reviewed this article in light of the exclusivity rights and ownership of proprietors over the reasonable use of airspace and the principles of easement and leasing as available in the National Land Code of Malaysia.

In addition, Norhusna Emirah Onn (2022)⁴⁵ further analysed the development and the application of the common law principle of *ad coelum* of airspace based on the Malaysian perspective. The article further highlighted the current Malaysian standing with regard to the ownership of airspace as mentioned in the National Land Code. The article extensively mentioned several concepts of airspace which are the navigable airspace, the low-altitude airspace and the proprietor's airspace. The controversial part of airspace is the low-altitude airspace as it sits in the middle and in between the navigable airspace of manned aircraft and the reasonable use of proprietor's airspace. The researcher referred to this article as the principle of *ad coelum* may be misinterpreted due to the rigidity of laws in defining the minimum altitude for the UAVs to fly. The ambiguity of the law in defining minimum low-altitude airspace for commercial UAVs and reasonable use of proprietor airspace is indeed a lacuna in Malaysian legislation.

⁴⁵ Norhusna Emirah Onn, "The Principle of Ad Coelum in Respect to the Low-Altitude Airspace for the Commercial Unmanned Aerial Vehicles (UAVs) in Malaysia", *International Journal of Law, Government and Communication*, 7 (30), (2022): 110-123.

Norhusna Emirah Onn and Farah Sherwani Md Tahir (2022)⁴⁶ analysed the current position of Malaysian law and regulation for commercial use has been extended to the agriculture UAVs. The introduction of CAAM directives, Civil Aviation Directive 6011 Part II (CAD 6011 Part (II) – UAS AGR) specifically designed for agriculture commercial UAVs is one step toward a bright future of commercial UAVs in Malaysia where the society is ready for the technological changes in agricultural sectors. Furthermore, the discussion of this article focused on the safety requirements available for the operation of agriculture UAVs based on the said directive. The researcher reviewed this article to see the safety features and requirements available for the operation of commercial UAVs in agriculture which is considered as one risk assessment feature that shall be in every commercial UAV.

Wong (2022)⁴⁷ discussed the laws and regulations which are still in force in Malaysia with regard to the operation of UAVs. The discussion of the article focused on the issue of surveillance by law enforcement which currently is extended to UAVs. The author highlighted the importance of surveillance by using UAVs for law enforcement to reduce the crime rate and safety of the public. The footage and video captured by the UAVs can be seen as electronic evidence which can be accepted by the court.⁴⁸ The article provides the researcher with additional knowledge on the application of laws which may also apply to law enforcement. Thus, the concept of surveillance and policing can be one of the solutions to monitor commercial UAVs and thus lessen the issue of trespass.

⁴⁶ Norhusna Emirah Onn., & Farah Sherwani Md Tahir, “An Analysis of the Regulatory Framework of Commercial Agriculture Unmanned Aerial Vehicles (UAVs) in Malaysia”, *International Journal of Law, Government and Communication*, 7 (28), (2022): 40-51.

⁴⁷ Wong, H. S., “Penggunaan Dron Oleh Penguatkuasa Undang-Undang Dalam Menjalankan Tugas Harian: Isu Undang-Undang Di Malaysia”, *International Journal of Law, Government and Communication*, 7 (29), (2022): 504-512.

⁴⁸ Ibid., 509.

In addition, Noor Asyikeen Mohd Salleh and Peng (2022)⁴⁹ further underlined the right to own property as fundamental liberty though the ownership of the property is not absolute which subject to the state's authority consent to acquire private land. This article analysed how to balance public and private interests in land acquisition. The researcher referred to this article to evaluate the best practice for the government in compulsory acquiring the proprietors' airspace in realising the right of way for commercial UAVs. This article provided the common ground in balancing public and private interests where both can attain the right of enjoyment over the property.

In addition, Vines *et al.*, (2022)⁵⁰ argued on a comprehensive legal implication of UAVs from a legal aspect as well as in technical and engineering aspects. The discussion is mostly on the technical aspects of UAVs and the laws and regulations in Australia. This article is well written by applying the law to the reality of the function of UAVs. The predictions by the authors are reasonable to implicate the usage of UAVs in all aspects by providing various examples. The discussion covers all aspects of law from negligence, strict liability, insurance, trespass, nuisance, surveillance and privacy. Thus, this article may provide a comprehensive picture of the operation of UAVs by referring to various examples. The principles highlighted in this article provide additional information for the research to evaluate promptly the laws on UAVs in all aspects.

Moreover, De Schrijver in 2019,⁵¹ evaluated that currently there is no overall international framework for the civil use of UAVs. Most rules governing UAVs are

⁴⁹ Noor Asyikeen Mohd Salleh., & Peng, S., "Striking Balance between Public and Private Interests in Land Acquisition: Cross-Jurisdictional Perspective", *IIUM Law Journal*, 30(1), (2022): 135-164.

⁵⁰ Vines, P *et al.*, "Predicting Bearing Fault in The Drone Freight Industry: Legal Liability in Australia", *J. Air L. & Com.* 87 (2022):299.

⁵¹ De Schrijver, S., "Commercial Use of Drones: Commercial Drones Facing Legal Turbulence: Towards New Legal Framework in the EU", *US-China Law Review*, 16(8), (2019): 338-353.

currently set at the UN level, by the ICAO, the UN body which is dealing with civil aviation.⁵² In this respect, international rules require submission of the relevant authorization request demonstrating that the UAV complies with the requirements of airworthiness as mentioned in Articles 20 and 29 of the Chicago Convention. The author further suggested the development of harmonizing UAV law and the issue of cross-border UAVs within the EU Member States. Furthermore, UAVs in European airspace are subject to a fragmented set of rules that fail to address several safety issues. This gives rise to the issue of cross-border UAVs within EU jurisdictions. The uniformity of law for UAVs covers both the constitutional aspects and the legal aspects of the safety and security of individuals. The researcher seeks to suggest a suitable framework for the regulation of UAVs in Malaysia as well as to have a uniform law throughout Malaysia, by drawing lessons from the EU countries which succeeded in introducing a uniform law.

In imposing a standard of liability in UAVs for commercial purposes, Harris (2018)⁵³ suggested the doctrine of strict liability shall apply to the manufacturer of UAVs. The discussion of his article focused on the extent of liability imposed for UAV operations in case of negligence. The author also evaluated the manufacturer's duty to provide a safe and high-quality UAV, as failure to do so makes the manufacturer subject to strict liability rules. Furthermore, the article examined the concept of vicarious liability in the operation of UAVs, which the researcher believed is pertinent to the commercial use of UAVs. When imposing vicarious liability, a commercial contract should be used to bind the employer and employee to adhere to and perform their duties thoroughly.

⁵² Ibid., 340.

⁵³ Harris, K.K., "Drones: Proposed Standards of Liability", *Santa Clara High Technology Law Journal*, 35(1), (2018): 73.

In addition, Ilker (2016)⁵⁴ mentioned that the development of commercial use of UAVs in the USA was not welcomed as compared with the European Union where the European Aviation Safety Agency (EASA) had taken a strong pro-business approach in drafting regulations for welcoming the commercial use of UAVs. Apart from registration and approval from the Federal Aviation Authority (FAA), the requirement of certification of airworthiness is essential for the operation of commercial use of UAVs. Several guidelines also are strict to avoid a hazard or threat to the public. The Secretary of Transportation will analyse the UAVs' size, weight, speed, operational capability, proximity to airports and populated areas, operation within visual line of sight, right-of-way, flying altitude, and time of operation. The FAA imposes a "see-and-avoid" requirement on all aircraft operations. This "see-and-avoid" requirement means vigilance shall be maintained by each person operating an aircraft and the right of way to see and avoid other aircraft. The EASA on the other hand has recognized the benefits of commercial UAV operations where it will foster an innovative and competitive European Drone industry, creating new employment, in particular for Small and Medium-sized Enterprises (SMEs).⁵⁵ The EASA realises this by dividing UAVs into three categories based on operations and providing regulatory rules for each category; open, specific, and certified.⁵⁶

Shbeeb (2018)⁵⁷ addressed commercial UAV deliveries for the interest of communities. The author wrote about the possible benefits the communities may gain from commercial UAV deliveries. UAV deliveries can be considerably faster than the

⁵⁴ Ilker, A., "Regulating Commercial Drones: Bridging the Gap Between American and Europe Drone Regulations". *Journal of International Business and Law*, 15(2), (2016): 313-336.

⁵⁵ Ilker, 318.

⁵⁶ Ibid., 319.

⁵⁷ Shbeeb, J., "Thou Shalt Not Drone Thy Neighbor", *Liberty University Law Review*, 13(1), (2018): 61-90.

current means of delivery. Three major issues would likely arise; trespass and nuisance.⁵⁸ According to the author, the interests that can be protected by having a common interest community agreement for the UAV deliveries include (1) the investment of those that purchased a lot or unit, (2) freedom from nuisance, (3) safety in the face of falling drones, (4) quick deliveries and cheap deliveries, and (5) the right to use his or her property as desired.⁵⁹ The researcher examined the effectiveness of having a common interest community agreement in light of the commercial use of UAVs.

Bernauw in 2016,⁶⁰ addressed the ICAO has recognized the evolution of UAVs as per Article 8 of the Chicago Convention. Further, ICAO has published a Manual on Remotely Piloted Aircraft Systems (RPAS) to guide UAV matters in the legislative and regulatory process. There was also a general comment that the UAV should be allowed to operate without isolation from other airspace users. He further recognized and acknowledged that UAVs have an impact on safety and security that includes trespass, risks, and liability in accidents. The author considered that the operation of unmanned aircraft is more complex, they present a degree of intensity and acuteness that warrants a special approach and regulation.⁶¹ The author further proposed in his article on the future and possible regulations for the UAV, among others 1) the new unmanned aviation is to be integrated into the existing manned aviation, 2) Given the international nature of aviation and taking into account the potential international use of UAVs, an internationally coordinated approach is required to develop a global harmonized and

⁵⁸ Ibid., 62.

⁵⁹ Shbeeb, 63.

⁶⁰ Bernauw, K., "Drones: The Emerging Era of Unmanned Civil Aviation", *Zbornik Pravnog Fakulteta Zagrebu*, 66(2-3), (2016): 223-248.

⁶¹ Ibid., 231.

unified regime.⁶² The researcher feels that the integration of manned aircraft and UAVs could not be achieved in a short period because it requires further discussion, especially with regard to cross-border territory.

Moreover, Strong (2016),⁶³ wrote in order to get an exemption under section 333 FAA Modernization and Reform Act 2012,⁶⁴ the production companies are required to prove that their proposed UAV operations would: (1) not adversely harm the safety of persons and property in the air and on the ground, and (2) be conducted in the public's interest. Not only that but the author also mentioned that the film and television industry, through their Summary Grant of Exemptions, established a prototype for the parameters of effective UAV use, which the FAA should rationalise for safely integrating UAVs into the national airspace.⁶⁵ In the Malaysian context, the researcher analysed the laws available in the USA as a benchmark in analysing safety issues of the operation of UAVs for the suitability of Malaysian industry particularly on the exemption to fly where the production companies must show that their UAV operations will not cause hazards to the public.

Next, Anderson in 2015,⁶⁶ mentioned that the Federal Aviation Authority of the USA projected the use span a wide variety of industries for the UAVs including real estate, filmmaking, photography, agriculture, and even package delivery. Issues of safety are the main issue in agriculture. Farmland would provide a large room for the operators to explore agricultural land without posing a huge risk to the safety of the public. UAVs could increase agricultural efficiency while decreasing the extraneous

⁶² Ibid., 234.

⁶³ Strong, M. J., "Oh the Drone-Abilities: Hollywood's Drone Pursuit Heats Up and the FAA Can't Stop It", *Cardozo Arts & Entertainment Law Journal*, 34(3), (2016): 863-908.

⁶⁴ FAA Modernization and Reform Act 2012, (the USA).

⁶⁵ Strong, 866.

⁶⁶ Anderson, L. T., "The Sky's The Limit: UAS Regulation and Changing Applications in Agriculture", *Kentucky Journal of Equine, Agriculture, & Natural Resources Law*, 8 (2), (2015): 401-424.

use of chemicals and water waste.⁶⁷ By allowing UAVs used in agriculture, the Federal Aviation Authority may obtain a better understanding of how to approach safety issues moving forward in the agriculture area. In addition, Hall and Rumley (2017)⁶⁸ argued that UAVs also may present risks and liabilities for commercial agricultural businesses and proprietors. Although the UAVs offer a surveillance tool that may infringe upon perceived property rights and that, in the hands of those opposed to agricultural production or desiring to cause public harm, could be used to mischaracterize agricultural practices or harm agricultural property and goods. The guidelines for the agricultural use of the UAV are stated in the Operation and Certification of Small Unmanned Aircraft Systems (Small UAS Rule). The principle of "see and avoid" is adopted in the guidelines for airspace collision avoidance.⁶⁹ The researcher analysed the UAV law available in the USA to affect the current situation, adaptation, and relevancy of the UAV laws to the agriculture sector in Malaysia.

Indeed, an article by Farber (2017)⁷⁰ discussed the various tortious issues the flying UAVs. However, the author mentioned the implications of UAVs in the light of tortious law. The author further reviewed the available UAV laws in different states of the USA.⁷¹ The existing UAV legislation in different states of the USA is relevant to be analysed for this research as the USA and Malaysia have similar approaches in practising federalism. The researcher observed the pros and contrasts of how the USA enforces the UAV law by referring to this article.

⁶⁷ Ibid., 411.

⁶⁸ Hall, P., & Rumley, R., "Legal Challenges Facing Unmanned Aerial Systems and Commercial Agriculture." *University of Arkansas at Little Rock Law Review*, 39(3), (2017): 389-424.

⁶⁹ Ibid., 396.

⁷⁰ Farber, H.B., "Keep Out: The Efficacy of Trespass, Nuisance and Privacy Torts as Applied to Drones", *Georgia State University Law Review*, 33(2), (2017): 359-410.

⁷¹ Ibid., 374-377.

In addition, Castillo-Ruiz (2015),⁷² commented on the new responsibility of the FAA of the USA in the regulatory framework for the integration and commercialisation of civil UAVs into the US domestic airspace. The author commented on the issues of safety, security, and operational considerations that are crucial and must be addressed immediately, other vital issues-particularly private property rights must be tackled as well.

Under the law of negligence, everyone must avoid foreseeable risks of harm. The foreseeable risk of harm could be held by having an assessment of risk before flying the UAVs. It is good to highlight an article written by Huneberg in 2017,⁷³ which overviewed the development of UAV laws in South Africa⁷⁴ which has become one of the first countries to have comprehensive UAV laws set out in part 101 aims to manage UAVs in the civil sphere with a significant emphasis on safety, security, and training of the operator.⁷⁵ The author contended that there is an argument for UAV owners to procure insurance, not only to protect the device from damage but also to safeguard against expensive claims for damages in case they cause any kind of injury to other persons. The rapid development of UAVs and UAV technology worldwide addresses the issue of insurance regarding the regulations required to cover the risk of using such machines.⁷⁶ The relationship of risk by the UAVs with different types of liability in terms of negligence should be signified in the legislation. Just like other road vehicles, insurers will only undertake to cover such a risk if the insured has the necessary license

⁷² Castillo-Ruiz, F.E., "Property and Privacy Issues Arising from the Integration of Civil and Commercial Drones into the Domestic Airspace of the United States", *Annals of Air and Space Law*, 40, (2015): 297-346.

⁷³ Huneberg, S.S., "On Drones, New Risks and Insurance", *Journal for Contemporary Roman-Dutch Law*, 80(4), (2017): 586-601.

⁷⁴ South Africa was invited to present draft regulations on RPAS at an international ICAO Symposium on 24 March 2015: see more ICAO, "Remotely Piloted Aircraft Systems Symposium", 23-25 March 2015, <<https://www.icao.int/meetings/RPAS/Pages/default.aspx>> (accessed on 19 August 2023).

⁷⁵ Huneberg, 593.

⁷⁶ Ibid., 587.

required for the use of such systems, as licensing is imposed by legislation. Thus, the issue of registration of UAVs is crucial to be highlighted in the legislation.

Furthermore, Tarr and Tarr (2021)⁷⁷ proposed numerous issues that need to be examined to make insurance mandatory for UAV operations. The authors addressed the concept of risks and insurance, where insurance for UAVs is regarded as unique, hence there is inadequate evidence to estimate the risks and liabilities. The insurance computation is still based on the manned aircraft, with certain modifications, such as eliminating the passenger clause. The researcher views that the legislation in Malaysia specifically on UAVs should highlight the possibility of risks of UAVs to the public. We call this the requirement of assessment of risk from each operator of UAVs before flying the UAVs, therefore, the issue of insurability can be assessed and calculated based on that assessment. As such, both articles provide additional insight into the lacuna of UAV law in terms of liability and insurability and thus it can be viewed and further evaluated from this article from the Malaysian perspective.

Further, Hodgkinson and Johnston (2018)⁷⁸ mentioned that safety requirements that most jurisdictions have implemented include UAVs that must be flown within a visual line of sight and shall only be flown in visual meteorological conditions. The authors acknowledged that every vehicle shall have different safety guidelines and suit their purposes. Geofencing in UAV technology could prevent UAV operations in sensitive security areas and restricted or dangerous areas such as near aerodromes. The researcher reviewed this article in discussing the safety requirements and guidelines for

⁷⁷ Tarr, J.A. & Tarr M.T.A., “Compulsory Liability Insurance for Drones in Australia”, *Insurance Law Journal*, 31 ILJ, (2021): 197.

⁷⁸ Hodgkinson & Johnston, 158.

each type of commercial use of UAVs as each type requires a different set of guidelines suited to its purposes.

Next is the issue of the foreseeable implication in terms of trespass. Farber (2017)⁷⁹ critically analysed the law on trespass by aircraft and by UAVs. A traditional element of trespass for a claim to be successful, the plaintiff must show that the defendant: (1) had entered the land without consent, or caused a thing or a third person to do so; (2) had remained on the land"; or (3) had failed to remove from the land a thing which he had a duty to remove.⁸⁰ Trespass actions may also include invasions beneath the surface of the ground or in the airspace above the land to a reasonable extent. The author further elaborated that flight by an aircraft in the airspace above the land of another is trespass if (1) the aircraft enters into the immediate reaches of the airspace next to the land, and (2) it interferes largely with the other's use and enjoyment of the land.⁸¹ However, the Restatement (Second) Of Torts Section 158 (Am. Law Inst. 1979) provides that over-flights are trespasses if: (1) they are in the immediate reaches of the land, and (2) they interfere with the use and enjoyment, the proximity of the flying object to the land or structure and the reach of one's possessory interest in airspace are essential to look at. When the flight overpopulated the skies, the navigated airspace was introduced. The researcher analysed the concept of navigable airspace for UAVs and compared it with the concept of *ad coelum* of proprietor over reasonable airspace.

The author added the case of the *United States v. Causby*,⁸² the Supreme Court ruled that a proprietor owns "at least as much of the space above the ground as he can occupy or use in connection with the land". The court decided that the plaintiff had an

⁷⁹ Farber, 381.

⁸⁰ Ibid.

⁸¹ Ibid.

⁸² *United States v Causby* (1946) 328 U.S. 256.

actionable claim for aerial trespass when the aircraft was flying at a particularly low altitude. The proximity of the flying object was tested in this case. As seen in *Causby*, where large military planes flew well below normal altitude for this type of aircraft and caused frequent disruption to the livestock, the proprietor's chicken was so frightened by the noise of the aircraft that chicken flew into the wall and died,⁸³ as a result, the court awarded compensation to the proprietor. The Restatement Second of Torts⁸⁴ adopts this principle that flights fifty feet above one's property substantially interfere with a proprietor's use and enjoyment of his property thus constituting an aerial trespass. The author further suggested that assessing the gravity of the harm caused by UAVs will require a different set of considerations and factors to determine if a one-pound UAV hovering 150 feet over someone's backyard will constitute an aerial trespass.

The UAVs that are overpopulated in Malaysia today whether recreational or commercial are flying at the range of below 500 feet and relatively weighing around 20 kilograms and above. In Malaysia, we still have not received any complaints concerning the UAV. However, this research is very important by looking at the problems that have happened in other countries thus Malaysia may prepare to face these legal problems in the future. The researcher suggested that the enjoyment of airspace of individuals over their property should be up to one hundred feet from the ground taking into consideration the high technology of cameras attached to the UAVs that have capabilities to zoom in on the view. In a case of aerial trespass by UAVs, the proprietor needs to establish and bring proof that the defendant had committed aerial trespass as a result of the flying UAVs and has breached the enjoyment of the airspace of the proprietor. The study builds on and contributes to work in framing a clear provision on

⁸³ Farber, 383.

⁸⁴ Restatement (Second) Of Torts (Am. Law Inst. 1979), s 159.

the flying zone in legislation which is essential to prevent the operator of UAVs from committing trespass. The word aerial airspace and navigable airspace also should be clearly defined in the UAV legislation. The researcher suggested the appropriate and safe proximity for flying UAVs should be indicated and drawn in the UAV legislation.

Further, Spelman (2015)⁸⁵ analysed the issue of trespass from the common law test in determining trespass by UAVs which among others are; 1). Above Roof-Level Flight, 2). Eye-Level Altitude Flights, 3) Mid-Altitude Flights (Above Eye-Level, Below Roof-Level), and 4) Common-Law Trespass. The author highlighted the different types of trespass that may be affected by flying UAVs.

Next, regarding the legal implication of UAVs in nuisance, Sehrawat (2018)⁸⁶ mentioned the types of UAVs that are commonly used in the USA and the implications of UAVs in terms of liability in negligence as well as in nuisance and the solution for the implications that are yet to be regulated by the legislator which leaves the loophole of UAV law in the USA. Usually, injunctive relief and damages are the types of claims by the plaintiff in the case of a nuisance. Nuisance can be in terms of a public nuisance or a private nuisance. Public nuisance requires that the harm affect at least one individual, which means the harm must be "public harm," undesirably affecting public health or safety. On the other hand, private nuisance requires unreasonable interference with the use and enjoyment of one's land. Interference can be that the defendant's conduct creates a condition such as noise, vibration, odour, or light that unreasonably interferes with the plaintiff's use and enjoyment of his land. According to the author, courts may be willing to accept nuisances caused by UAVs as a "noise of progress" in

⁸⁵ Spelman, S., "Drones: Updating the Fourth Amendment and the Technological Trespass Doctrine", *Nevada Law Journal*, 16(1), (2015): 373-418.

⁸⁶ Sehrawat, V., "Liability Issue of Domestic Drones", *Santa Clara High Technology Law Journal*, 35(1), (2018): 126.

the early 21st" century just as they have accepted trains and automobiles in the early 20th century.⁸⁷ The researcher agreed with the author that the possibility of a nuisance claim caused by UAVs should be highlighted properly in the legislation so that people and operators of UAVs are well aware of the possible consequences of flying UAVs. If the rapid interference by the UAVs is caused by noise, then a new technology to cope with this issue is most welcome for invention.

Lastly, for a better view from the perspective of South East Asia, Siyuan (2017)⁸⁸ evaluated the possibilities of loopholes and lacunas in law despite having specific legislation on UAVs. The Singapore government enacted the Unmanned Aircraft (Public Safety and Security) Act in 2015 and also amended various existing laws relating to air navigation leaving great challenges that would be faced when enforcing the law against recreational users of aerial imaging in particular. Is the limited proximity of 50 meters between a person and structure relevant and good practice for this technology which we well know that UAVs have greater know-how and abilities than humans or any other devices? One of the ambiguities was the prohibition of flying at night, most jurisdictions have left the issue undefined, but this is mainly because they experience multiple seasons and dramatic light changes every year.⁸⁹ The researcher agreed with the author on the point that it is better to be as precise with the law as possible on the extensive duties of the operator of UAVs on liability in case of negligence. Does the word fly safely considered the correct explanation for the responsibility to avoid negligence? Will the restrictions limit the commercial use of UAVs to operate in low-altitude airspace?

⁸⁷ Sehwat, 126.

⁸⁸ Siyuan, C., "The Regulatory Framework for Aerial Imaging by Recreational Users of Drones in Singapore", *Singapore Academy of Law Journal*, 29(1), (2017): 126-162.

⁸⁹ Ibid., 135.

From the Islamic perspective on the commercial use of UAVs, Ridzwan Ahmad (2008)⁹⁰ explained the method of *maslahah* and *mafsadah* used as guidance by Muslim Scholars to resolve contemporary Muslim problems. He further acknowledged that science and technology as complementary to human life although they gradually change according to time thus the *maqasid al-shariah* will come into the picture serving the hierarchy of needs of human beings.⁹¹ The researcher evaluated this article by discussing the concept of *maslahah* and the implication of commercial use of UAVs toward the public, especially its application in the situation of pandemic or necessity. Further, an article written by Semati *et al.*, (2016)⁹² overviewed the concept of technology from an Islamic perspective. The adaptation of technology with the civilization of the society is interrelated and complementary to each other and indeed contributed to the intellectual foundations of the Constitutional Revolution of 1906 in Iran.⁹³ The researcher examined this article to analyse the relationship of technology that is considered to be beneficial to society with the *hukum* of the usage of the technology from the perspective of commercial use of UAVs.

1.13 CHAPTERISATION OF RESEARCH

This in-depth research is structured into six chapters to analyse the regulation of commercial UAVs in Malaysia. Chapter One highlights the beginning of the research proposal which covers the problem statements, the research questions, the objectives of the research and the hypothesis of the research. In addition, this chapter reviews the

⁹⁰ Ridzwan Ahmad, “Metode Pentarjihan Maslahah Dan Mafsadah Dalam Hukum Islam Semasa”, *Jurnal Syariah*, jil. 16, bil 1, (2008): 107.

⁹¹ Ibid, 137.

⁹² Semati, M *et al.*, “Elite Discourse on Technology in Iran Negotiating Technology, Modernity and Islam”, *Sociology of Islam*, 4 (2016): 323-344.

⁹³ Ibid., 330.

research methodology that the researcher opts to use for the whole chapter. Thus, the scope and limitation of the study also are highlighted in this chapter to see the extent and the coverage of the research *vis-à-vis* the research objectives. Apart from that, the proposed schedule of research also is mentioned in this chapter to view the connection of the duration of the study with the proposed chapters. The significance and contribution of the research also are explained in this chapter to see the possible future development of the research in Malaysia. Furthermore, this chapter reviews the previous studies from the various kinds of literature from the various scholars in various journals to see the future contributions towards the issues that can be highlighted in the research for the Malaysian context. Lastly, the chapterisation of the research is highlighted in this chapter to overview the discussion and the analysis of the legal issues of this research.

In chapter two, this research discusses the conceptual legal framework and jurisprudence on the regulations of commercial use of UAVs in Malaysia. The discussions are mainly to answer “what is” and the historical concept of legal issues connected to commercial UAVs which are based on landmark cases. The concept of commercial, ownership, trespass, nuisance, safety, risks and liability is properly evaluated and defined in this chapter.

Furthermore, chapter three evaluates the laws and regulations available for commercial UAVs as of now in Malaysia and the international arena. This chapter also evaluates the enforcement mechanisms available in the international arena and Malaysia which are the responsible parties and agencies in dealing with the regulatory and the application of licences and permits for the operation of UAVs. This chapter serves as a benchmark to evaluate any loophole and gap in the existing laws and regulations for the in-depth research in the following chapters.

Chapter four is in-depth research on the rights to airspace for the commercial use of UAVs in Malaysia. The research focuses on the legal regime and the existing law of airspace which is to be applied to the UAVs. An in-depth analysis is carried out to define the *ad coelum* principles by segregating airspaces into two; horizontal airspace and vertical airspace. The zoning of airspace is a critical mechanism to avoid future trespass and nuisance. Apart from the analysis of the concept of easement and leasing to suit the demand of commercial UAVs are considered alternative methods to line up the low-altitude airspace for the commercial UAVs. The Islamic concept of *mawat* land also is evaluated in the context of the low-altitude airspace for the commercial UAVs due to the lawless area of airspace as compared to the navigable airspace of manned aircraft and the proprietor's airspace.

Hence, chapter five is a critical analysis of the duties and liabilities of commercial UAVs in Malaysia which is the main focus of the discussion in terms of the implications that might occur connected to the operation of UAVs especially in the issue of negligence. The issues of strict liability, breach of warranty of the manufacturer, and foreseeability of risk are indeed dependent on the categories of UAVs and types of operations.

Lastly, chapter six provides the conclusion and findings of the research. Furthermore, recommendations and suggestions for commercial UAVs are also included in this chapter to value the laws and regulations for the commercial use of UAVs. Hence the way forward and issues of further research also are included in this chapter to appreciate this new technology thus the legislators may provide sufficient laws and infrastructure for the sustainability of the Malaysian economy.

CHAPTER 2

THE CONCEPTUAL FRAMEWORK & THE JURISPRUDENCE ON THE REGULATIONS OF COMMERCIAL USE OF UAVS IN MALAYSIA

2.1 INTRODUCTION

This chapter highlights the legal foundations of this research which are related to the commercial use of UAVs. The discussion of this chapter is purely based on the existing conceptual approach and juristic opinions from the various scholars *vis-à-vis* the legal issues of this research. Further, the discussion focuses on the legal concepts which are connected with commercial UAVs, among others on the concept of airspace ownership, right of way for UAVs, implications of UAVs with regards to trespass and nuisance, strict liability principle, breach of warranty and the concept of foreseeability of risks which leads to the insurance requirements for the commercial UAVs.

In other words, the related subject matter of this research highlights mostly the legal principles of land law, torts law and contracts law which form an important legal foundation for UAV law in Malaysia.

2.2 THE JURISPRUDENCE OF 'COMMERCIAL' IN THE OPERATION OF UAV

The term "commercial" refers to both contract and property. Sales, for example, are based on contract but serve as a mechanism for transferring property, and secured credit and negotiable instruments, on the other hand, are based on the property but were largely facilitated by contract.¹ In other words, the concept of commercial involves a contract which forms between two parties. Similar to how equity and fiduciary duty serve as the foundation for businesses, many notions in commercial law are derived from the private law categories of contract, property, tort, and restitution.² A realistic model of the risk-allocation techniques employed by commercial parties must serve as the foundation for any theory of the best default rules for commercial contracts.³ In other words, the theory of commercial is moulded on the allocations of risks by parties to the transactions. The contract will serve as the basis for enforcing the parties' obligations and responsibilities.

In the case of *Warwickshire County Council v Halfords Autocentres Ltd (Competition and Markets Authority intervening)*,⁴ the commercial practice may be formed by or developed from a test purchase made of a product (including a service) that is commonly promoted to and intended for purchase by consumers, even if the purchaser is not a consumer, may constitute or result in commercial practice as well.⁵ In other words, an activity involving consumers in dealing with the test of a product or

¹ Linarelli, J., "Analytical Jurisprudence and the Concept of Commercial Law", *Penn State Law Review*, 114(1), (2009): 126.

² Ibid.

³ Scott, R. E., "Relational Theory of Default Rules for Commercial Contracts", *Journal of Legal Studies*, 19(2 Part 2), (1990): 600.

⁴ *Warwickshire County Council v Halfords Autocentres Ltd (Competition and Markets Authority intervening)* [2019] 2 All ER 69 (QB).

⁵ Ibid.

service can be an indicator that it is indeed a commercial activity. Further, in *Alderson v Secretary of State for Trade and Industry*,⁶ the court highlighted the nature of a commercial endeavour requires that the activity under consideration be carried out for reward.⁷ It is widely accepted that the service has become commercial in nature. The term “commercial” refers to a business transaction to make a financial profit. The definition of “commercial” is of, engaged in, bearing on commerce, focused on money profit rather than artistry.⁸ A commercial enterprise involves a transaction or series of transactions in which the individual or the commercial entities engage to supply something in value to receive something in future. Furthermore, in the case of *SerVaas Incorporated v Rafidain Bank*,⁹ the Supreme Court observed the term “commercial transaction” is defined as being in use for the purpose of that commercial transaction at all times until the payment is received.¹⁰ It is being used to collect payment in accordance with the terms of the business transaction from which it originated. Section 3(3) of the Civil Jurisdiction and Judgments Act, 1982 defines “commercial transaction” as follows:

“(a) any contract for the supply of goods or services;
(b) any loan or other transaction for the provision of finance and any guarantee or indemnity in respect of any such transaction or of any other financial obligation; and
(c) any other transaction or activity (whether of a commercial, industrial, financial, professional or other similar character) into which a state enters or in which it engages otherwise than in the exercise of sovereign authority ...”¹¹

⁶ *Alderson v Secretary of State for Trade and Industry* [2004] 1 All ER 1148 (COA).

⁷ *Ibid.*

⁸ *Ibid.*, 1152.

⁹ *SerVaas Incorporated v Rafidain Bank* [2013] 1 AC 595 (SC).

¹⁰ *Ibid.*, 597.

¹¹ Civil Jurisdiction and Judgments Act 1982, (UK), s 3(3).

Furthermore, under the Competition Act, 2010, section 3(4) excludes several activities which is not by their nature a commercial activity as follows;

“For the purposes of this Act, “commercial activity” means any activity of a commercial nature but does not include—
(a) any activity, directly or indirectly in the exercise of governmental authority;
(b) any activity conducted based on the principle of solidarity; and
(c) any purchase of goods or services not for the purposes of offering goods and services as part of an economic activity.”¹²

It is evident in Malaysia that the phrase “commercial” refers to activities other than those involving government authority, solidarity and charity. The term commercial use in the operation of UAVs indicates an operation of UAVs other than for private and recreational purposes. Furthermore, the UAVs of law enforcement also are not within the ambit of commercial UAVs. UAV-based services or products arising from the UAV operations for which are paid directly in cash fall under the most precisely identified class of commercial UAV operation. Therefore, any services and operation of UAVs connected to gain profits and wages are considered for commercial purposes. In other words, earning money from any products and services derived from UAV operations also constitutes commercial UAV use.

Meanwhile, there are several contracts and agreements that the operator and the owner of commercial UAVs may enter into to constitute a commercial purpose. However, the rights, duties, liabilities and risks are varied based on the contract that they enter into. The agreement could be from a hire and rental agreement, employment agreement, sale and purchase agreement, and even agency agreement.

¹² Competition Act 2010 (Act 712), (Malaysia), s 3(4).

2.3 THE CONCEPT OF OWNERSHIP OF LOW-ALTITUDE AIRSPACE

The controversial and main problem in regulating commercial UAVs is to determine the ownership of the low-altitude airspace which is situated between the proprietors' airspace and the federal airspace which is the navigable airspace of manned aircraft. The low-altitude airspace here can be regarded as no-man rights. Although the claim of no-right man has existed for centuries, the zoning of such rights has not been finalised, creating a never-ending debate for such rights. In order to discuss that matter, it is appropriate to understand the concept of ownership. The concept of ownership is usually interrelated with property law and land law. The term ownership refers to the possession which is further attached to rights and liabilities.

According to John W. Salmond,¹³ the concept of ownership denotes the relationship between a person and any right that is vested in him.¹⁴ Ownership, in this generic sense, extends to all classes of rights, whether proprietary or personal, *in rem* or *in personam*, *in re propria* or *in re aliena*.¹⁵ In other words, the concept of proprietary ownership exists if a person possesses, holds, or owns the exclusive right to the property, and the legal possession is shown through the registration of ownership in the title to the property. Proprietary right is also known as right *in rem*, which means “right against a thing” in Latin. The action against property would be decided by the court in that matter. *In personam*, however, it means “against the person”, where the action or judgement is enforceable against the person rather than the property. In addition, *in re propria* refers to the exclusive right to full ownership of the land. *In re aliena*, on the

¹³ Salmond, J., “Jurisprudence or the Theory of the Law”, *Stevens and Haynes*, (1902): 267.

¹⁴ Ibid.

¹⁵ Ibid.

other hand, refers to a person's right over another's property, such as in a tenancy. This privilege allows the person to possess the property but not to own it.

Furthermore, ownership and possession are two different concepts. The owner may own the rights as attached to the ownership but the possession of the rights is a case-by-case scenario. However, in the end, ownership and possession later will integrate into *de jure* or *de facto* relationships to complete its existence. Even limitation and extent of rights coupled with ownership are also restricted by other instruments or dealings to whom it is assigned. A man can have a right without owning it, such as when a wrongful occupant of land uses a right of way or other easement attached to it. Alternatively, he may own a right without actually possessing it.¹⁶

There are six theories of airspace ownership which developed throughout centuries which are; 1) the absolute ownership theory, 2) the public easement theory, 3) the privilege of flight tort theory, 4) the ownership to a fixed height theory, 5) possible effective possession theory; and 6) no-ownership theory.¹⁷ Firstly, in the absolute ownership theory which was popularized by Lord Coke based on the *ad coelum* maxim. According to the maxim "*cujus est solum, eius est usque ad coelum*" the proprietor owns unlimited airspace above the land. Nonetheless, due to the advancement of the country and society, this ancient maxim is no longer applicable in the twenty-first century. Furthermore, the commercialization of UAVs has given rise to a contentious claim to airspace.

Secondly, public easement theory highlights the modification from the *ad coelum* maxim. According to this theory, the owner owns the airspace above his property, but it is subject to a public easement for aviation traffic. Although the owner

¹⁶ Salmond, 269.

¹⁷ Cahoon, C., "Low Altitude Airspace: Property Rights No-Man's Land", *Journal of Air Law and Commerce*, 56(1), (1990): 163-166.

owns all of the airspaces above his property, aviation is legally granted a property right (easement) to traverse this property.¹⁸

Thirdly, in the privilege of flight tort theory, the proprietor is still being honoured based on the *ad coelum* maxim but the modification of the maxim emphasises that when an aircraft passes over his property, he has committed a trespass, however, this trespass is privileged. Aircraft can freely fly through the airspace as long as the privilege to trespass or the magnitude of the easement is not surpassed.¹⁹ Fourthly, ownership of a fixed height theory is based on the vertical zoning of airspace. The boundary set by the law refers to the navigable airspace. According to this theory, all airspace above the boundary and at a fixed height above sea level is considered public space. Therefore, the proprietor owns the airspace below the boundary. As a result, if the aircraft flew above the boundary, the proprietor had no recourse. An actionable trespass occurred if the aircraft flew below the boundary.²⁰

Fifthly, the Possible Effective Possession Theory highlights the airspace property rights of a proprietor are restricted to a specific height of effective possession.²¹ This theory uses the subjective test as it depends on the nature of the land and the effective use of the land. Thus, all airspace above the proprietor's potential effective possession is public property, and the owner has no legal claim thereto.²² The concept of effective possession can be applied *mutatis mutandis* to the concept of reasonable use of airspace. The concept of reasonableness is always highlighted in all legal systems, especially in torts law. It offers a rational analysis of the general rule and sometimes provides a departure from the rule. In the case of *Australian Securities and*

¹⁸ Cahoon, 164.

¹⁹ Ibid., 165.

²⁰ Ibid.

²¹ Ibid.

²² Ibid., 166.

Investments Commission v Rich,²³ the court defined the word reasonable as a decision premised on logic or sense. The context of the claim of the reasonable use of airspace by the proprietors is based on the logical and rational sense until which altitude they can manage their airspace. Nevertheless, this approach would be varied and subjective thus the realisation of low-altitude airspace for the UAVs seems ambiguous.

Lastly, the no-ownership theory highlights that the proprietor's rights over the airspace are limited to the airspace in which he or she is occupied.²⁴ Regardless of the altitude flown, an overflight is only compensable if actual physical damage to the underlying property has taken place.²⁵ This notion restricted the proprietors' ownership in using airspace that they fairly occupied. This theory may allude to the proprietor's ownership of the airspace being confined to the roof of the home, which is considered the highest airspace that the proprietor may own. If this idea is applied to UAVs, as long as the UAVs do not contact the proprietor's roof, the UAV operator and pilot can avert liability for trespass and even nuisance. The theories of airspace are summarized in Figure 2.1 as follows:

²³ *Australian Securities and Investments Commission v Rich* [2009] ACSR 1.

²⁴ *Hinman v Pacific Air Transp* 84 F.2d 755 (1936) (9th Cir).

²⁵ *Ibid.*

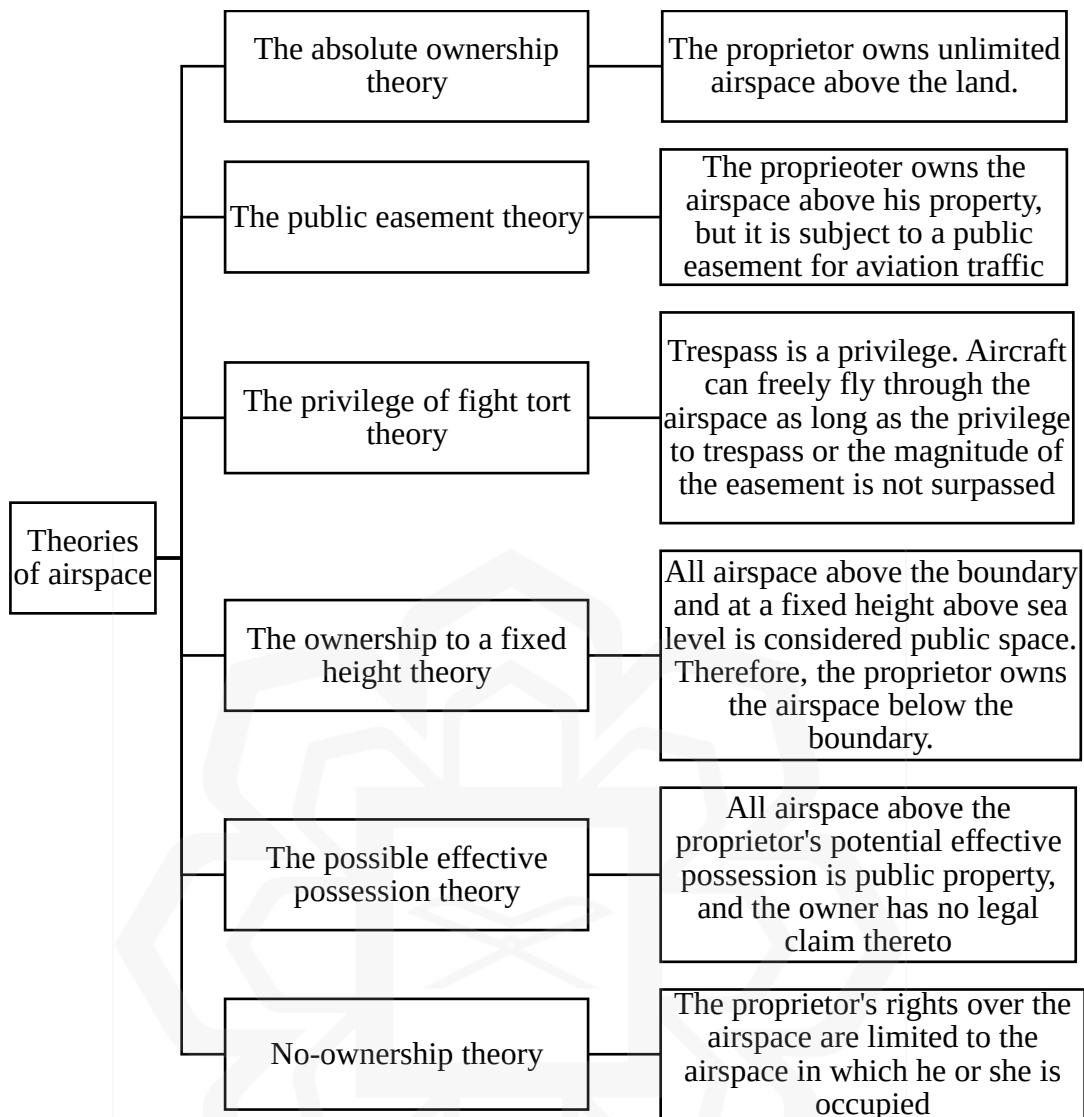


Figure 2.1 Theories of Airspace.²⁶

The ownership of airspace for commercial UAVs is indeed a new subject matter and is still yet to be determined by the authority and even in the international arena on the exact altitude of airspace which is the most suitable for commercial UAVs. It is an established law of property and land that the proprietor of land owns not only the surface of the land but it coupled with the ownership of beneath land as well as reasonable airspace. The concept of land ownership is based on the ancient maxim established by

²⁶ Cahoon, 164.

Roman law which later integrated into the common law principle “*cujus est solum, eius est usque ad coelum*.”²⁷ Conversely, in theory, the land refers to soil and does not include airspace. The undetermined altitude of airspace has raised the controversial claim of airspace ownership between the proprietor of the land and the navigable airspace. The infrastructure of UAVs for the right of way is still in a vague and grey area and currently, the law governing the ownership of airspace can be divided into two mainstream; 1. Proprietor airspace; and 2. Navigable airspace. The term navigable airspace refers to the airspace above the minimum safe altitude of flight as set by the Chicago Convention as the minimum of 500 feet from the surface of the land. Due to that, it leads to the principle of *ad coelum* owing to the unlimited claim by the proprietor over the airspace. Thus, to what extent ownership of the sky or the *ad coelum* principle will apply to the proprietor of the land? In *United States v Causby*,²⁸ the Supreme Court held that ‘if the proprietor is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere. This case rejected Lord Coke’s *ad coelum* principle where which principle does not apply to the modern world. The Court rejected the notion that property rights extend indefinitely upward, arguing that interpreting the *ad coelum* doctrine so broadly would make air travel virtually impossible without potentially exposing pilots to constant trespass claims.²⁹ There were two views regarding the *ad coelum* principle for airspace, the first view interpreted *ad coelum* as indefinite upwards and the second view interpreted *ad coelum* as undetermined but not unlimited height.³⁰ The court determined that a proprietor owned the "super adjacent" airspace above his property and that an intrusion of this airspace

²⁷ It is defined as whoever owns the land, he will own up to heaven.

²⁸ *United States v Causby* (1946) 328 U.S. 256.

²⁹ *Ibid.*, 261.

³⁰ Fagg, F., “Airspace Ownership and the Right of Flight”, *Revista Juridica de la Universidad de Puerto Rico*, 2(2), (1932): 110.

should be considered an actual invasion of the surface. However, the court refused to determine where the proprietor's right over the airspace should be ended leading to subjective views in determining the boundaries of the proprietor's airspace.

The undetermined *ad coelum* of airspace leads to the determination of the right of way for the UAVs. The right of way is an acknowledgement of ownership over the property. The concept of the right of way or in common law is called an easement; passing the land upon territories without changing the proprietorship.³¹ Besides, ever since the Wright Brothers made their historic flights in 1901, the right of way for airspace has been established. In 1900, there was a proposal made by Paul Fauchille, at the Neuchatel session of the Institute of International Law caught the attention of jurists to develop air codes and regulations.³² Currently, that right has served as the international customary rule by the introduction of navigable airspace which until today was accepted as uniform law by the worldwide community at a minimum altitude of 500 feet from the surface of the land. As of today, the UAV airspace is yet to be determined by CAAM. The only restriction for UAVs is not to fly UAVs more than 400 feet from the surface of the land. Thus analogically, it sets the maximum altitude for the UAVs to fly in the airspace. However, the minimum altitude of airspace for UAVs is still in a vague area and is yet to be determined due to the controversial claim of the proprietor over the low-altitude airspace.

Furthermore, if the ownership of low-altitude airspace belongs to the proprietor, then permission to use the said airspace is essential to avoid a future claim on trespass or even nuisance. Thus, the creation of the right of way or easement of airspace is the best method while waiting for the integration of navigable airspace for both manned

³¹ Morey, W. C., "International Right of Way", *American Lawyer*, 12(2), (1904): 55.

³² Fagg, 105.

and unmanned aircraft. Easement usually involves a private proprietor and at the discretion of the said proprietor grants such rights for the creation of a passageway. According to the *Gale on Easements*, an easement must be a known and common type of interest. In *Dyce v. Hay*,³³ Lord St. Leonards ruled that to keep up with the advancements of society, the category of servitudes and easements must transform and broaden. Moreover, in 1896 Lord Herschell expressed a similar opinion as follows:

“Easements may be of various characters, and it is a fallacy to suppose that every easement must be brought within some particular class which has been recognized, such as the class relating to watercourses, or light or air or otherwise.”³⁴

Further, there are four requirements to create an easement. There are 1) there must be a dominant land and a servient tenement land; there should be two different land to qualify for a grant of easement, 2) the dominant tenement must conform within an easement; the easement must benefit the land and can accommodate the dominant tenement, 3) there must be two distinct owners—dominant and servient; and 4) an ownership interest in land must be capable of becoming the subject of a grant to qualifying as an easement.³⁵ In other words, an easement must serve and accommodate and should be reasonably necessary to offer enjoyment with that tenement.³⁶

Alternatively, the government may also initiate the right of way designed especially for UAVs by imposing the provisions under the Land Acquisition Act where certain low-altitude airspace can be declared or gazetted by the Act as public airspace

³³ *Dyce v Hay* (1852) 1 Macq. 305, at p. 312.

³⁴ *Simpson v Mayor of Godmanchester* [1896] 1, Ch. 214, 218-219.

³⁵ *Re Ellenborough Park* [1965] 1 Q.B. 76.

³⁶ McClean, A. J, “The Nature of an Easement”, *Western Law Review*, 5, (1966): 44.

for commercial UAVs. The compulsory acquisition will create a definite right of way for commercial UAVs and thus will sustain the demand for their commercial usage.

Despite easement, another method to utilize the right of way is by leasing the airspace. The term lease refers to the temporary transfer of an asset in exchange for periodic payments known as rent.³⁷ The lessor typically is the owner while the lessee usually will obtain periodical free interference over the asset or property. In common law, the concept of a lease is enshrined in the property or personal property. In Malaysia, the concept of leasing has emerged as one of the land dealings and is protected under the National Land Code. The acquisition of leasing is not permanent as the rights and interests of the said property still belong to the proprietor. Leasing involves the temporary acquisition of assets, whereas ownership involves the permanent acquisition of assets.³⁸ Leasing is considered the flexible method for temporarily holding the rights and interests of the property. In the view of commercial UAVs, leasing of airspace will guarantee the right of way for commercial UAVs to fly in low-altitude airspace and thus create economic demand for the usage of UAVs. It also shows the legal way to have a clear line of low-altitude airspace for commercial UAVs.

2.4. THE CONCEPT OF TRESPASS AND NUISANCE

The conflict of interest over the airspace from both the proprietor and the aviator is a natural and endless discussion. One of the most perplexing issues in aviation since its inception has been the issue of air rights.³⁹ Therefore, the introduction of UAVs into low-altitude airspace also will create continuous conflicts due to their nature as flying

³⁷ Merrill, T. W., "The Economics of Leasing", *Journal of Legal Analysis*, 12, (2020):1.

³⁸ *Ibid.*, 3.

³⁹ McLendon, M., "Aviation and the Law of Trespass", *Kansas City Law Review*, 1(1), (1932):10.

objects. The concept of ownership shows some sort of protection and right available for the owner of property and land from intrusion and interruption from the outsider. Thus, trespass is viewed as one of the implications of such rights. Trespass is an infringement on the right to exclusive possession of land.⁴⁰

The evolution of trespass to land can be categorized into three eras: the period of no reports, from 566 A. D. to 1194 A. D.; the period of records, from 1285 A. D. to the present; and the period of common-law reports from that time to the present.⁴¹ The purpose of the trespass action was to provide a remedy, and damages were typically awarded if they were requested or even directly implicated.⁴² However, Coke's Report⁴³ served as the foundation for the first actual application of the doctrine of *ad coelum* on the trespass to land in cases involving birds and hawks flying over one's land.⁴⁴ The application of the doctrine of *ad coelum* is interrelated to the rights and the implication of such rights to protect the proprietor against any damage to the property; thus the emergence of trespass to such right is relevant discussion. In 1815, in the case of *Guille v. Swan, a New York*,⁴⁵ the crowds rushed forward and tramped the crops as a result of the balloonist's descent into a garden, and the court found him liable for trespass. From the hot ballon's case which faced a similar situation as UAVs, we can conclude that the airspace trespass is a continuous conflict shall have full attention to the legislator to line the airspace vertically and horizontally to avoid the trespass suit due to the flying UAVs.

⁴⁰ Watson, T., "Maximizing the Value of America's Newest Resource, Low-Altitude Airspace: An Economic Analysis of Aerial Trespass and Drones", *Indiana Law Journal*, 95(4), (2020):1410.

⁴¹ Deiser, G.F., "Development of Principle in Trespass", *Yale Law Journal*, 27(Issue2), (1917-1918): 221.

⁴² Ibid.

⁴³ Coke's Report was a habit of record-keeping and observation employed by common lawyers in the early seventeenth century at the bar and the bench and the Inn's Court compiled by Sir Edward Coke, the British jurisprudence.

⁴⁴ Baker, J.H., "Coke's Note-Books and the Sources of His Reports", *Cambridge Law Journal*, vol. 30, no. 1, (Apr., 1972):54.

⁴⁵ *Guille v Swan* (1815), 19 Johnston, N. Y. 38.

Trespass actions may also include invasions beneath the surface of the ground or in the airspace above the land to a reasonable extent. Flight by an aircraft in the airspace above the land of another is trespass if 1) the aircraft enters into the immediate reaches of the airspace next to the land, and 2) it interferes largely with the other's use and enjoyment of the land.⁴⁶

The common law test for determining trespass by UAVs among others are; firstly, is the Above Roof-Level Flight which takes into account the airspace directly above the house, backyard, and up to 100 feet above the house's roof.⁴⁷ Secondly is the Eye-Level Altitude Flights, whereby the extremely low airspace above private property, such as the airspace in a backyard at eye level or within a few feet of a person's home window is protected by the constitution.⁴⁸ Thirdly, regarding the Mid-Altitude Flights (Above Eye-Level, Below Roof-Level), it is not entirely clear whether the airspace above private property, below the house's roof, and above the backyard walls (which is approximately ten to thirty feet above the ground) is protected by the constitution.⁴⁹ There is a likelihood that this test would not be applied in determining trespass. The concept of within the surrounding the home or land should be applied in measuring the proprietor's enjoyment over his airspace.

Lastly, the Common-Law Trespass; test in determining trespass by UAVs further can be divided into two sub-doctrine: 1) physical traditional trespass doctrine; and 2) new technological trespass doctrine.⁵⁰ Under the physical traditional trespass doctrine, the government does not breach the law by trespassing on private property

⁴⁶ Watson, 1403.

⁴⁷ Spelman, S., "Drones: Updating the Fourth Amendment and the Technological Trespass Doctrine", *Nevada Law Journal*, 16(1), (2015):402.

⁴⁸ Ibid., 404.

⁴⁹ Ibid.

⁵⁰ Ibid., 376.

until it enters a house or its boundaries (the area immediately surrounding the house).⁵¹ Meanwhile, the new technological trespass doctrine relatively recent notions, compels the government to acquire a warrant before employing technology to gather information within residential areas, or otherwise would be considered trespass because it is being constitutionally protected region.⁵² This new doctrine is suitable to the current UAV operations where the grant of a permit to fly UAVs is essential. This concept is relevant to determine the level and ability to fly by the commercial use of UAV depending on the different eyesight of people and the task is given especially on segregation of airspace. Moreover, segregation of airspace also could avoid trespass where the operator may pre-program the UAV to a certain altitude not to exceed or on encroach the limitation set by the program. In addition, several locations in Malaysia have been declared as no-fly zones for security purposes, such as Putrajaya, Kuala Lumpur City Centre (KLCC), the Parliament, and Istana Negara. Any other government location that is not open to the public can also be considered a no-fly zone, these include police stations, prisons, government offices, and military bases.⁵³

Besides trespass as one of the implications that commercial UAVs may face, another implication and legal issue may arise when it involves nuisance. Nuisance from the UAVs could be in the form of vibration and noise which form an interference. The word nuisance comes from the Latin word “*nocumentum*,” which developed a special legal connotation early in the history of a nuisance that was the subject of legal complaints.⁵⁴ Nuisance is of common-law origin that stems from the maxim that “a man shall not use his property to harm another”. A nuisance is defined as anything

⁵¹ Spelman, 377.

⁵² Ibid., 378.

⁵³ Drone Academy Asia, “Drone Laws and Regulations in Malaysia”, 15 February 2023, <<https://www.droneacademy-asia.com/post/drone-laws-and-regulations-in-malaysia>> (accessed 6 February 2024).

⁵⁴ Winfield, P. H., “Nuisance as Tort”. *Cambridge Law Journal*, 4(2), (1931): 189.

wrongfully done or permitted that interferes with or annoys another's enjoyment of his legal rights.⁵⁵ In other words, a nuisance is a condition that causes an unwarranted interference with the ownership and enjoyment of another's property due to some noxious or harmful characteristic.⁵⁶ The concept of nuisance differs from the concept of trespass in that nuisance is only a result of what is not directly or immediately injurious, whereas trespass involves immediate property interference.⁵⁷ In other words, nuisance is an interference with the private use and enjoyment of land that does not involve interference with possession. The implication and consequence of the act or omission would determine whether the injury or type of damage is immediate or not. The interference could be intentional or negligent, or it could be the result of an extra-hazardous activity that carries strict liability.⁵⁸ In the case of *St. Helens Snelting Co. v. Tipping*,⁵⁹ Mellor J delivered the judgement on nuisance as follows:

“Every man is bound to use his own property in such a manner as not to injure the property of his neighbour, unless, by the lapse of a certain period of time, he has acquired a prescriptive right to do so. But the law does not regard trifling inconveniences; everything must be looked at from a reasonable point of view: and therefore in an action for nuisance to property by noxious vapours arising on the land of another, the injury to be actionable must be such as visibly to diminish the value of the property and the comfort and enjoyment of it.”⁶⁰

It is subjective to measure the reasonableness of the operation of commercial UAVs which cause a nuisance to the public. Every case and operation of commercial UAVs is different and the level of interference resulting from the nuisance shall be

⁵⁵ Jaggard, E., “Hand-Book of the Law of Torts”, *St. Paul, Minn, West Pub. Co.*, (1895):744.

⁵⁶ *Fordham Law Review*, “Zoning and the Law of Nuisance”, 29(4), (1961): 749.

⁵⁷ Jaggard, 745.

⁵⁸ Prosser, W., “Handbook of the Law of Torts”, *St. Paul, West Publishing Co.*, (1941): 549.

⁵⁹ *St. Helens Snelting Co. v Tipping* (1863) 4 B. & S. 608, 616; 11 11. L. C. 642.

⁶⁰ *Ibid.*

treated case-by-case scenario. How much interference from the enjoyment of possession over the property is definitely a subjective test.

The implication of nuisance can be categorized into a public or common nuisance, private nuisance, and mixed nuisance. A public nuisance infringes on the rights of the community's citizens as a whole, regardless of the number directly harmed. Private nuisances, in contrast, affect one or more people while they are exercising an individual right not shared by the general public. Those that are mixed or combined are both a public and a private nuisance.⁶¹ Private nuisance refers to an unauthorised intrusion or interference into someone's use or enjoyment of land, or of a right thereto, or in connection with it, which includes injuries to servitude and other rights attached to the property.⁶² The rule of strict liability and private nuisance was mentioned in the case of *Rylands v. Fletcher*, the court held that:

“If a person brings or accumulates on his land anything which, if it should escape, may cause damage to his neighbour, he does so at his peril. If it does escape and cause damage, he is responsible, however careful he may have been, and whatever precautions he may have taken to prevent the damage.”⁶³

It was decided to succeed in the tort, the plaintiff needed to prove that; 1) that the defendant brought something onto his land, 2) that the defendant made a non-natural use of his land, 3) the thing was something likely to do mischief if it escaped, and 4) the thing did escape and cause damage. The general question in determining whether a defendant bears liability to a plaintiff for whatever harm the plaintiff may have suffered is not whether the defendant acted with due care and caution, but rather whether his

⁶¹ *Garfield Box Co. v Clifton Paper Bd. Co* (1941) 125 N.J.L. 603, 17 A.2d 5-3 (Sup. CL).

⁶² Winfield, 190.

⁶³ *Rylands v Fletcher* (1866) L. R. 1 Ex. 265.

actions have caused the harm. By laying these ideas into practice with regard to commercial UAVs, which almost certainly will carry greater payloads than normal and occasionally liquid payloads, it could be possible to define under number two the idea of non-natural use. The subjective nature of what constitutes natural usage and non-natural use necessitates further investigation and judicial discretion. But if the law could quantify and specify what is abnormally dangerous, the strict liability concept may be used in this situation. If we don't address this issue, strict liability will be applied, which will halt the development of commercial UAVs in Malaysia.

The interference of UAVs may come from noise and vibration as well. The controversial claim over nuisance usually takes place due to the conflict of rights of the individual to enjoy property free of disturbance. If the disturbance comes under annoyance to the public then the claimant must prove the case accordingly. The controversial element of nuisance shall be highlighted based on the notion of public goods. However, protecting the interests of individual homeowners may not always serve the public good. The decisions of the courts should contribute to a broader understanding of the public good derived from a utilitarian concept of allocating costs and benefits.⁶⁴ The introduction of commercial UAVs may involve frequent take-off and landing therefore there is a high possibility that the issue and claim of nuisance from the commercial UAVs may be raised by the public due to the persistent disturbance and annoyance from the commercial UAVs. As a result, zoning law will come into the picture to limit and restrict further disturbance and annoyance and thus serve public policy. Nuisance can be seen in public nuisance or private nuisance. The issue of nuisance could also be raised by the public who are affected by the noise and

⁶⁴ Peterson, G., "The Intrinsic Flaws of Contemporary Railroad Nuisance Jurisprudence in Terms of the Public Good", *Transportation Law Journal*, 27(2), (2000): 226.

vibration of flying UAVs. Nuisance can be in terms of a public nuisance or a private nuisance. Public nuisance requires that the harm affect at least one individual, which means the harm must be “public harm,” undesirably affecting public health or safety. On the other hand, private nuisance requires unreasonable interference with the use and enjoyment of one's land.

2.5 THE CONCEPT OF NEGLIGENCE, SAFETY AND RISKS IN COMMERCIAL UAVS

The next implication is on the safety issue which leads to the legal issue of negligence if the party abundant it. The law seems to look further at the possibility of the flying object falling over the heads of people, crowds, or property. In illustrating the history of negligence, it is important to note that negligence did not become an independent tort until the early nineteenth century, the course of action in the case of negligence usually resulted in the inevitable overlapping of negligence with other types of tort.⁶⁵ In an action for negligence, the plaintiff must prove the existence of a duty of care between the plaintiff and the defendant. The duty arises from the concept of a neighbourhood where every man is bound not to injure his neighbour.⁶⁶ The burden of proof lays on the plaintiff that the defendant had breached the duty of care and thus caused damage and injury to the plaintiff.

The classic neighbourhood principle as developed in the classic case of *Donoghue v Stevenson*,⁶⁷ is the best concept to review the existence of a duty of care

⁶⁵ Winfield, 198.

⁶⁶ Ibid.

⁶⁷ *Donoghue (or McAlister) v Stevenson* [1932] All ER Rep 1.

and the proximity of the damage that occurred which resulted from the breach of that duty. Lord Atkin delivered in his judgement held that:

“The rule that you are to love your neighbour becomes in law: You must not injure your neighbour; and the lawyer's question: Who is my neighbour? receives a restricted reply. You must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour. Who, then, in law is my neighbour? The answer seems to be persons who are so closely and directly affected by my act that I ought reasonably to have them in contemplation as being so affected when I am directing my mind to the acts or omissions which are called in question.”⁶⁸

Furthermore, in the case of *Le Lievre and another v Gould*,⁶⁹ Lord Esher introduced the principle of proximity when he said:

“That case established that, under certain circumstances, one man may owe a duty to another, even though there is no contract between them. If one man is near to another or is near to the property of another, a duty lies upon him not to do that which may cause a personal injury to that other, or may injure his property.”⁷⁰

The measurement of the operator's duty and liability to the public begins not only when the UAVs start flying, but also when the proximity of the relationship based on the neighbourhood principle is heavily applied to take reasonable precautions to avoid danger and injury that would likely be foreseeable. The idea of predictability provides a risk assessment and prediction, both of which are crucial for the operation of commercial UAVs. As a result, pre and post-liabilities were considered in the assessment and predictability of hazards in commercial UAVs.

⁶⁸ *Donoghue (or McAlister) v Stevenson* [1932], 1.

⁶⁹ *Le Lievre and another v Gould* [1893] 1 QB at p 497.

⁷⁰ *Ibid.*

The foreseeability of risk is interrelated to the cause of action for negligence in determining the concept of the reasonableness of the type of injury or damage. The concept of risk is commonly defined as the possibility or likelihood of suffering harm as a result of a hazard.⁷¹ The term hazard can refer to either the external agent that caused the harm or the harm that resulted from it (the type of injury). The “hazard event” is the accident itself, which is the incidence or event in which the harm-causing agent causes the damage.⁷² Determination of risk is subjective and may depend on qualitatively or quantitatively. The risk assessment, on the other hand, involves a determination of the probability of occurrence which measures the likelihood of the hazard event. The term likelihood refers to a mathematical probability that can be quantified based on its frequency.⁷³ Thus, the discussion on safety and risk would then require insurability issues. How greater risks of commercial UAVs depend on the types of commercial activities and operation of the UAVs. The risks involved vary from one operation to another operation.

Moreover, for the precaution and possibility of future tort claims, insurance shall be compulsory for every commercial use of UAVs. Insurance for commercial UAVs shall access the risk management that possibility may be incurred towards the consumer, third party, or even the public. The application also needs to include the reason for the UAV's operation as well as proof of reasonable personal and property damage insurance, as required by law. Poland, Sweden, South Africa, and the United Kingdom are among the countries involved. Several countries require every operator of UAVs especially commercial UAVs to acquire insurance for the vehicles and any third-party

⁷¹ Walker, V.R., “The Concept of Baseline Risk in Tort Litigation”, *Kentucky Law Journal*, 80(3), (1991): 637.

⁷² Ibid.

⁷³ Ibid., 642.

claim. In New Zealand, UAVs weighing more than 25 kilograms are subject to extensive requirements among others; particulars of the types of UAV, identification and control system to be used, and operational procedures and airworthiness assessments.

Next, the terms negligence and strict liability are now part of a debate in regulating UAV law. The personal and private use of UAVs usually uses a lightweight UAV, the impact of the UAV if it falls over the head of people is not as severe as the commercial use of UAV. Commercial UAVs typically use at least 20 kilograms UAVs for their operation. Just imagine any object weighing 20 kilograms falling over our head, thus the injury may be more serious as compared to a lighter UAV. Safety aspects and operation before, during, and after take-off and landing are essential to be followed by the operator to avoid danger to the public. Siyuan⁷⁴ addressed that many lacuna and loopholes are still not perfected by the Singapore Aviation Act and regulation. Among others is the issue of distance, speeding, proximity,⁷⁵ a threat to privacy rights, and permit to fly the UAV. The question of visual line of sight also was raised by the author. Do the legislators take into consideration that every human has different eyesight? Does the visual eyesight depend on the colour, physical shape of the UAV, vibration, or even signal and light of the UAV?⁷⁶ The issue of distance parameters was not elaborated by the law or from any circular of the Aviation Authority. The ultimate aim of every legal framework is to attain stability and balance for both the user and the safety of the public. The issue of negligence involving accidents while conducting the operation is certainly related to the management in assessing risk on and before the operation by observing

⁷⁴ Siyuan, C., "The Regulatory Framework for Aerial Imaging by Recreational Users of Drones in Singapore", *Singapore Academy of Law Journal*, 29(1), (2017): 137.

⁷⁵ Ibid.

⁷⁶ Ibid., 137-138.

the safety guidelines. The analysis of the failure will circle whether such failure is from the UAV or the operator. That is why the requirement in licensing and permit to fly the UAV, especially for commercial purposes mentions the inspection of the device as well as the requirement of an operator to obtain a certificate of airworthiness and specific knowledge and training on UAV.

2.6 THE CONCEPT OF LIABILITY IN COMMERCIAL UAVS

Until the end of the nineteenth century, the law progressed in the direction of limiting tort liability to "fault," in the sense of wrongful intent or deviation from the community standard of conduct.⁷⁷ Liability in the context of private law often occurs and arises from the relationship of contract or the existence of a duty. In other words, liability connotes a responsibility which might be created through a contract or it is the responsibility that emerges due to duty. The idea of legal liability refers to the duties that must be upheld by the law for a person to be held accountable for violating obligations.⁷⁸ Besides, legal liability is linked to social risk, which is a circumstance where any human action, whether or not it was voluntary, in violation of the law or not, has harmed certain interests, subjective rights, or the rule of law or created a risk that they will be injured and necessitates compensation from the person who took the action.⁷⁹ Furthermore, legal liability arises due to legal relationships created through mutual relations, social relations and even moral relations.

The terms of commercial use of UAV refers to the commercial law itself which connotes the variety and types of commercial transaction. To a layman, commercial use

⁷⁷ Prosser, 426.

⁷⁸ Stanescu, L., "Prolegomena for Definition of the Structural Concept of Legal Liability", *Perspectives of Law and Public Administration*, 10(1), (2021): 125.

⁷⁹ Ibid., 128.

of UAVs may refer to any transaction that involves gaining profit for the owner as well as for the operator. But in a legal area, the word commercial itself would involve transactions among others like; 1) sale and purchase transaction; 2) agency law; 3) hire and leasing transaction, and; 4) employment law. The emergence of technology often comes with legal liability. A sense of responsibility usually creates liability. The liabilities connected with commercial UAVs depend on the types of commercial transactions that the parties enter into. The application of commercial UAVs somehow rapidly creates liability from the various commercial contracts. Therefore, the duty that arises will differ according to the types of commercial agreements that the parties enter into. The duty that arises from the commercial UAVs could be from the arrangement of the agency contract, employment contract, rent and lease contract and even sale of goods contract. The parties to the contracts will bear different liabilities as the duty arises based on the contractual basis. The owner, the operator and the manufacturer are the key main parties in commercial UAVs based on the duties and the liabilities attached to their role.

There are three main parties involved in commercial UAVs. They are the owner, the operator or pilot and the manufacturer. All three of them bear different liabilities *vis-a-vis* commercial UAVs. The owner of the UAV is a person or body corporate who duly registered the name of the UAV. The liabilities connected to the owner may be limited based on the agreed arrangement set by the parties involved in the commercial UAVs. Thus, the owner who is not the operator may face lesser liabilities as compared to the one who operates the UAVs. Any conflict involving the commercial use of UAVs is solely based on the transaction agreed upon by the parties involved in the arrangement.

The Civil Aviation Regulation 2016 defines an operator as a person, organization, or enterprise engaged in or offering to engage in aircraft operation.⁸⁰ The aircraft per regulation here refers to both manned and unmanned aircraft. The operator can be identified as a person who, starting from take off until the landing of the UAV, has physical control over the UAV from the ground. The UAV operator can also be identified as the pilot of the vehicle that controls the vehicle from the ground. While for the operator or pilot of UAVs, in the Special Rule for Model Aircraft 79 Fed. Regulation, a commercial operator is a person who receives remuneration or hires and engages in the service of carriage of persons or property by aircraft in air commerce.

In 2013 in the case of *Pirker*,⁸¹ the FAA (the USA) brought the first enforcement action against a non-authorized commercial UAV operator. Noticeably, the restrictive approach of the FAA towards commercial usage of UAVs in *Pirker* possibly signifies the position of the agency in the coming years towards commercial use. An evaluation order was published by the FAA Administrator, Michael P. Huerta, which formed as a complaint in the very first compliance action to present against a private UAV operator to set a precedent for its prohibition against the unauthorized commercial use of UAVs. In that case, on October 17, 2011, Raphael Pirker operated a Ritewing Zephyr camera-equipped UAV over the University of Virginia campus for commercial use to capture aerial photographs and video of the campus and medical centre of the University of Virginia. He then uploaded the UAV-captured footage to the YouTube channel. His argument that the UAV was used for private purposes was denied at the moment he uploaded the footage on the YouTube channel and gained profit from YouTube. Commercial use of UAVs is indeed subject to strict requirements.

⁸⁰ Civil Aviation Regulation 2016 [P.U.A 97], r 2.

⁸¹ *Huerta v Pirker* (N.T.S.B. Nov. 17, 2014) N.T.S.B. Order No. EA-5730, 2014 WL 8095629.

2.6.1 Strict Liability

The manufacturers come into the discussion of UAVs here as they have a strict duty to manufacture UAVs according to the specifications approved by the laws. Many manufacturers and service providers are planning and ready to take control of the demand for both micro-drones and macho-drones.⁸² Based on public supply and demand, any growth in the new market for UAVs is considered sustainable. Due to the increasing demand of the market for UAVs, currently, ten approved manufacturers involved in manufacturing manned aircraft to take one step forward in manufacturing UAVs; they are 1) General Atomics, 2) Northrop Grumman Corporation, 3) Boeing Companies, 4) BAE System Plc, 5) Israel Aerospace Industries Ltd, 6) Lockheed Maartin Corporation, 7) Raytheon Technologies Corporation, 8) Textron Incorporation, 9) Elbit System Limited, and 10) Turkish Aerospace Industries.⁸³ Another company like DJI is one of the top consumer UAV manufacturers, known for its product named the Mavic series. In 2020 they launched Mavic Mini UAV with a weight of only a half-pound. Kespry further manufactures UAVs focussing on the mining, construction, and surveying industry. Moreover, Autel Robotics has been manufacturing UAVs with complex technology and easy-to-use functions that are suitable for photography and filming. Due to the demand for the operation of UAVs for commercial use, Skydio launched its Skydio 2 in 2019 as a commercial platform with advanced technology for flying artificial intelligence systems.⁸⁴

⁸² Perritt, H., & Sprague, E. O., "Developing Drop Discipline: Training and Testing Operators of Small Unmanned Aircraft Systems", *Hastings Science and Technology Law Journal*, (2015): 143-188.

⁸³ *Meticulous Research*, "Top 10 Companies in Unmanned Aerial Vehicle Market", 3 November 2020, <<https://meticulousblog.org/top-10-companies-in-unmanned-aerial-vehicle-market/>> (accessed 30 Dec 2020).

⁸⁴ *The UAV Coach*, "The Top 100 Drone Companies to Watch in 2020", <<https://uavcoach.com/drone-companies/>> (accessed 2 January 2021).

The concept of liability is extended to the legal philosophy of strict liability. Where the duty of the manufacturer is usually strict rather than the usual concept of negligence. The concept of strict liability was developed in the case of *Rylands v Fletcher*,⁸⁵ Lord Black Burn delivered his judgement held that:

“We think that the true rule of law is that the person who, for his own purposes, brings on his land, and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, he is prima facie answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to the plaintiff's default, or, perhaps, that the escape was the consequence of vis major or the act of God; but, as nothing of this sort exists here, it is unnecessary to inquire what excuse would be sufficient.”⁸⁶

During the early stages of common law, strict liability theories predominated. However, during the nineteenth century, there was a clear and deliberate shift in favour of the theories of negligence in England.⁸⁷ According to the concept of strict liability, the prima facie evidence is clear, such as the fact that the defendant shot the plaintiff.⁸⁸ Economically speaking, strict liability laws are ultimately preferred because they reduce decision-administrative making costs. According to the strict liability rules, the courts are not required to conduct any type of economic analysis in order to decide on a particular case. Flying UAVs could be also regarded as an unreasonably dangerous activity which falls under one limb of the strict liability rule. The term unreasonable dangerous connotes dangerous activity far beyond the expected ordinary and common activity. Flying aircraft would be a dangerous activity however unmanned aircraft would be an unreasonably dangerous activity due to the nature that it is without a pilot

⁸⁵ *Rylands and another v Fletcher* (1861-73) 1.

⁸⁶ *Ibid.*, 5-6.

⁸⁷ Epstein, R. A., “Theory of Strict Liability“, *Journal of Legal Studies*, 2(1), (1973):152.

⁸⁸ *Ibid.*, 173.

on the board. The payload for the operation of commercial UAVs also must be assessed accordingly whether the goods that the UAV carries are within the ambit of dangerous goods or not. The term dangerous good is defined in Article 2(11) of the EASA Commission Implementing Regulation (EU) 2019/947 as follows:

“dangerous goods means articles or substances, which are capable of posing a hazard to health, safety, property or the environment in the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:

- (a) explosives (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives);
- (b) gases (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);
- (c) flammable liquids (flammable liquids; combustible, fuel oil, gasoline);
- (d) flammable solids (flammable solids, spontaneously combustible solids, dangerous when wet);
- (e) oxidising agents and organic peroxides;
- (f) toxic and infectious substances (poison, biohazard);
- (g) radioactive substances;
- (h) corrosive substances.”⁸⁹

Commercial UAVs can carry such dangerous goods as per the demand of the market. Thus, the assessment of risks for such payloads should be the top priority of the operator and the pilot. It is indeed a heavy burden for the operator and owner of the UAV to operate the UAVs in accordance with the safety standards and procedures. Apart from that, the manufacturer of UAVs has a duty to deliver a quality and good product to the end customer.

Besides, the defective product may put the manufacturer liable both in strict liability and breach of warranty. The claim of strict liability against the manufacturer will involve the common law doctrine of *res ipsa loquitur* in providing evidence of the

⁸⁹ EASA Commission Implementing Regulation (EU) 2019/947, 2019, art 2(11).

fault of such a product. The concept of *res ipsa loquitur* is frequently applied in cases where objects fall from the places of the defendant and cause injury to the plaintiff. An extra precaution shall be applied if the object is situated above which is most likely to fall. Nevertheless, if no action is taken to avoid such a fall the evidence on the doctrine of *res ipsa loquitur* may apply. It is a sufficient verdict to highlight the concept of things falling from above and causing injury involving careless behaviour. The doctrine of *res ipsa loquitur* applies the facts to speak for themselves where it is no longer necessary for the plaintiff to prove fault, but it becomes incumbent on the carrier of the aircraft to exculpate himself of any fault.⁹⁰ The concept of commercial UAVs which fly above the sky will apply the concept of *res ipsa loquitur* where falls will cause injury and damage to person and property. The types of the payload of commercial UAVs are immaterial if the concept of *res ipsa loquitur* is applied in the negligent case.

The doctrine *res ipsa loquitur* tends to be an implied warranty in negligence cases. In addition, the cause of action for the breach of warranty is based on the contract form between the manufacturer and the customer. It is generally acknowledged that the original claim for breach of warranty was tortious, similar deceit.⁹¹ An express warranty became part of the contract of sale and was enforceable as a result of the development of the action of assumpsit, which offers redress for breach of contract.⁹² Eventually, the implied terms and warranty of the contract gradually developed in the commercial arena. If a servant offered a warranty on products he sold for his master, the warranty would not be actionable.⁹³ The action being on the contract, privity of contract was

⁹⁰ Fenston, J., "Res Ipsa Loquitur in Aviation", *McGill Law Journal*, 1(3), (1953): 209.

⁹¹ Ames, J. J., "History of Assumpsit", *Harvard Law Review*, 2(1), (1888-1889): 8.

⁹² Wade, J. W., "Strict Tort Liability of Manufacturers", *Southwestern Law Journal*, 19(1), (1965):6

⁹³ Ames, 8.

needed to put the party in the position he would have been in if the contract had been carried out.⁹⁴

2.6.2 Vicarious Liability

Another point of contention in evaluating liability in torts related to the commercial use of UAVs is the principle of vicarious liability. The commercial use of UAVs often involves various types of commercial contracts which bind the parties to the contract. The rule of vicarious liability emerges in this discussion when the relationship between the operator or the pilot of the UAV and the owner of the UAV is between master and servant. The concept of vicarious liability refers to when a person bears responsibility for another's wrongdoing without engaging in wrongdoing themselves. The modern explanation for this is a policy that assigns such duty to the party most qualified to bear and share the risk.⁹⁵ Thus, the notion that, in matters of contract and trust, it is the unique relationship between the principal and the third party, generated by this invitation of confidence, that serves as the basis of liability should it prove to be misplaced, comes into clearer focus.⁹⁶

Early English law moved away from such rigorous liability, and by the sixteenth century, it was believed that the master should not be held accountable for the torts of his servants unless he had specifically ordered them to do so.⁹⁷ After 1700, the courts started to return to the older norm under the fiction of a command to the servant "implied" from employment since this rule was deemed to be much too limited to

⁹⁴ Wade, 6.

⁹⁵ Prosser, 471.

⁹⁶ Baty, T., "Vicarious Liability: Short History of the Liability of Employers, Principals, Partners, Associations and Trade-Union Members with Chapter on the Laws of Scotland and Foreign States. Oxford", *Clarendon Press*, (1916): 12.

⁹⁷ Prosser, 472.

accommodate the growing complexity of trade and industry.⁹⁸ This notion evolved from the master-servant, employer-employee relationship, where the transferring culpability from servant to master and employee to employer drew legal attention. The basis for the concept of vicarious liability is that the master analogically has a greater financial account than the employee to pay liability. The master also has the right to command the servant on how to do jobs. According to Salmond,⁹⁹ there were certain tests to embark on for the principle of vicarious liability as follows:

“Test required that before vicarious liability can be inferred, there must exist a relationship of ‘master and servant’ between the defendant and the person committing the wrong. The servant, in committing the wrong, must have been acting in the course of his employment. A servant is deemed to be acting in the course of his employment if his act is either:
(a) a wrongful act authorised by the master; or
(b) a wrongful and unauthorised mode of doing some act authorised by the master.”¹⁰⁰

To apply this principle in the context of commercial UAVs, an employment agreement between the operator or pilot of the UAV and the owner of the UAV should be in place, and the operation of the UAVs should take place during the ordinary course of business. This approach, however, cannot be applied to an independent contractor. As a result, it is critical to identify what qualifies an employee or a servant under this principle. A servant is a person who works for a master and is subordinate to him in all of his business; the master has the authority to govern the servant's physical behaviour while performing the task in question.¹⁰¹ These servants are to be distinguished from other employed agents as well as independent contractors who enter into a contract to

⁹⁸ Prosser, 472.

⁹⁹ Salmond, 83.

¹⁰⁰ Ibid.

¹⁰¹ Prosser, 473.

work on behalf of the employer but are not employees with respect to their physical behaviour in carrying out the undertaking, subject to any such restriction or right of control.¹⁰² This distinction is crucial because it will have an impact on the employer's or master's culpability when an employee or servant commits a tort during their employment for which the employer or master would be held vicariously liable. When examining whether an employer-employee relationship even exists, the right to control is a key factor. The operator and owner of the UAV may be in an employment relationship if the operator receives instructions on how the work is to be done directly from the owner of the UAV. In the Malaysian context, additional factors and requirements under labour law should also be taken into account.

2.7 EVALUATION AND CONCLUSION

There is a high demand for the use of UAVs in the commercial arena arising from the willingness of society to embrace the advancement of technology in daily routine usage. The market for UAVs can be seen from two aspects, firstly in terms of the demand for the usage of UAVs for commercial purposes and secondly in terms of the demand for the manufacturing of UAVs according to the specification for commercial use. All legal issues in relation to commercial UAVs must properly be spelt in the law and regulation to avoid redundancy of duties and liabilities due to the broad scope of commercial contracts.

If the commercial use of UAVs is ever accepted in Malaysia, it definitely will create new job opportunities. By allowing UAVs to fly for commercial use, the pilot or operator of the UAV will need to acquire the certificate of competency as approved by

¹⁰² Prosser, 473.

the CAAM. The syllabus of this certificate must be approved by the CAAM, international level, and Malaysian Accreditation Agency (MQA) if this program is offered in public or private institutions. This is another impact of the use of UAVs on Malaysian economic growth.

From education, commercial, and economy, the commercial use of UAVs gives more benefits to corporations and the public. The UAV is considered a cost-effective technology because of its size, capabilities, and speed. The public or customer may receive more benefits from this technology as it facilitates many transactions according to the types of commercial use of UAV depending on the customer's choice. For example, in delivery made by UAV customers may receive the parcel in a shorter period of time depending on the distance and speed of the UAV. It also can reduce physical contact among people as a customer does not need to physically come to the shop to buy goods, therefore the commercial use of UAV is relevant to the pandemic and endemic era of COVID-19.

Apart from that, in the case of *Khairul Nizam bin Omar v Projek Lebuhraya Usahasama Berhad*,¹⁰³ the court suggested that the respondent could use the recent technology of UAVs to assist the third respondent in the early detection of dangers and impediments on the highway. The use of UAVs is easier, cheaper, faster, more accurate, and more effective than the use of existing machinery such as patrol cars or helicopters like those used today. This suggestion is also stated in the High Court case of *LBS Travel Sdn Bhd dan Satu Lagi v Nathan a/l Muthayah dan lain-lain*.¹⁰⁴ Accuracy and authentication of footage and images captured by the UAV area are highly reliable, giving it an important feature and paving the way for its usage in commercial use.

¹⁰³ *Khairul Nizam bin Omar v Projek Lebuhraya Usahasama Berhad* [2019] MLJU 530.

¹⁰⁴ *LBS Travel Sdn Bhd dan Satu Lagi v Nathan a/l Muthayah dan lain-lain* [2019] 8 MLJ 767.

Furthermore, from the customer's point of view, the commercial use of UAVs will give more options for them to choose alternative ways besides the conventional methods in the commercial arena. Customers are willing to use this service so long the concept of supply and demand are always in the circulation of the economy. Due to the changing of the new norms around the world, the usage of UAVs in the commercial arena is becoming more relevant to the practice of social distancing. The commercial use of UAVs will facilitate physical distancing, minimising close contact with people during the pandemic and endemic era.

Every aspect connected to the commercial use of UAVs must be looked at. The governing law must be able to address the legal issues arising from the use of UAVs for commercial use. This is essential to determine and distinguish the commercial use of UAVs from other uses of UAVs, including private use and law enforcement use. The strict requirements in the commercial use of UAVs are to ensure the accountability of all interested parties properly structured depending on the types of commercial transactions that they are entered into. A variety of categories of UAVs are mentioned in the European Union Aviation Safety Agency (EASA) UAV regulation which Malaysia has adopted in the 2021 circular further can be crystalized for segregation of airspace and harmonization of law as per the Chicago Convention. ASEAN also may suggest EASA policies on UAVs in harmonization and integration of the use of airspace for commercial UAVs.

Allowing commercial use of UAVs in Malaysia could invite many investors in Malaysia. It may also create new job opportunities for the certified operator or pilot of UAVs. Further, the education sector may also offer a new program for professional UAV operators and subsequently generate income in the education sector. The regulator and legislator should be ready to accommodate and support the commercial

use of UAVs in Malaysia by evaluating what constitutes approved and certified criteria for the commercial use of UAVs. Different functions of commercial use of UAVs may require different laws. The suggestions put forward in this research are indeed based on the current technology and capabilities of UAVs for the extension of commercial use and the demand of the public for the sustainability of the economy in Malaysia.



CHAPTER 3

THE REGULATION AND ADMINISTRATION OF THE COMMERCIAL UAVS IN INTERNATIONAL LAW AND MALAYSIA.

3.1 INTRODUCTION

This chapter highlights the existing laws and regulations which are currently being used in Malaysia and other countries as well as the international regulations which form a part of the UAV best practice in moulding the UAV law. This chapter evaluates the international Chicago Convention of 1944 as a benchmark for Malaysia in drafting the best practice regulations for commercial UAVs. In addition, this chapter examines the administrative and enforcement agencies at the international level for the smooth running of commercial UAV operations for the states' members. Hence, this chapter analyses the functions of government agencies in Malaysia as well in the administration of commercial UAVs and the enforcement of commercial UAVs. The integration of all relevant agencies in upholding the operation of commercial UAVs is essential to cater for the laws in Malaysia. Just imagine for the application of a permit to fly a UAV, the owner or operator of the UAV shall go to several different agencies for approval of specific requirements, as a result, it may negate the growth of commercial UAVs due to delay in application.

In sum, one important key point in this chapter is to highlight the possibility of integration of agencies available to offer a better and faster solution in the application

of permits and licences for UAVs especially in the commercial arena in order to boost the economy of the nation in the era of digitalization.

3.2 THE CHICAGO CONVENTION

The key aspect in moulding the UAV laws started at the international level before it transpired at the national level. The customary practice of international law keeps the states' members aware of the norms of law in adapting it into the national law. The development of the international regulatory framework for civil aviation started with the Paris Convention on 13th October 1919. The word pilotless was mentioned in Article 15 of the Paris Convention as follows:

“No aircraft of a contracting State capable of being flown without a pilot shall, except by special authorization, fly without a pilot over the territory of another contracting State.”¹

In furtherance of that, on 7th December 1944, the Chicago Convention replaced the Paris Convention. Article 8 of the Chicago Convention provides a provision for “pilotless aircraft”, as follows:

“No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization. Each contracting State undertakes to ensure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft.”²

¹ Standards and Recommended Practices (SARPs)-Remotely Piloted Aircraft Systems (RPAS) Manual (Doc10019), art 1.2.2.

² Convention on International Civil Aviation 1944 (Chicago Convention) (UN), art 8.

The intention of the drafter for Article 15 of the Paris Convention and Article 8 of the Chicago Convention must be considered due to the historical background of the world in accessing pilotless aircraft during the First World War operated by both civil and military. Article 37 of the Convention requires that all contracting State undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedures, and organization concerning aircraft, personnel, airways, and auxiliary services in all matters in which such standardization will facilitate and improve air navigation. This implies the emergence of UAVs as one unmanned flying aircraft. Article 37 of the Convention further highlights as follows:

“To this end the International Civil Aviation Organization shall adopt and amend from time to time, as may be necessary, international standards and recommended practices and procedures dealing with:

- (a) Communications systems and air navigation aids, including ground marking;
- (b) Characteristics of airports and landing areas;
- (c) Rules of the air and air traffic control practices;
- (d) Licensing of operating and mechanical personnel;
- (e) Airworthiness of aircraft;
- (f) Registration and identification of aircraft;
- (g) Collection and exchange of meteorological information;
- (h) Log books;
- (i) Aeronautical maps and charts;
- (j) Customs and immigration procedures;
- (k) Aircraft in distress and investigation of accidents;

and such other matters concerned with the safety, regularity, and efficiency of air navigation as may from time to time appear appropriate.”³

Therefore, uniformity of the law of UAVs for the signatory States shall be organized properly including in terms of cross-border operation of UAVs. The baseline

³ Convention on International Civil Aviation 1944 (Chicago Convention) (UN), art 37.

for UAV laws in Malaysia is according to Article 8 above. The word ‘special authorization’ connotes the responsibility of the Civil Aviation Authority of Malaysia to reflect the legality of flying UAVs in Malaysian air navigation. The Civil Aviation Authority of Malaysia has a duty to control the operation of UAVs with the paramount aim of obviating danger to civil aircraft. Besides, Article 37 of the Convention encourages each State to have uniformity in laws, regulations, standards, procedures, and organization concerning aircraft, personnel, airways, and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation which includes the operation of UAVs. Malaysia responded to the Chicago Convention by introducing the Civil Aviation Act of 1969, which serves as a framework of consistent and fundamental laws for both manned and unmanned aircraft. With the authority granted by the Civil Aviation Act of 1969, CAAM has developed several regulations and directives to affect the goal. The ICAO requires the UAV to demonstrate and comply with the requirements of airworthiness as in Articles 20 and 29 of the Chicago Convention. Article 36 further mentions that each contracting State may prohibit or regulate the use of photographic apparatus in aircraft over its territory.⁴

Moreover, The Eleventh Air Navigation Conference (ANConf/11), held in Montréal from September 22 to October 3, 2003,⁵ endorsed the global air traffic management (ATM) operational concept in which a UAV is a pilotless aircraft,⁶ as defined in Article 8 of the Convention on International Civil Aviation, that is flown without a pilot in command on board and is either remotely and fully controlled from another location (ground, another aircraft, space) or programmed and fully automated.

⁴ Convention on International Civil Aviation 1944 (Chicago Convention) (UN), art 36.

⁵ ICAO, The Eleventh Air Navigation Conference, 22 September to 3 October 2003, <[https://www.icao.int/Meetings/AMC/MA/Eleventh%20Air%20Navigation%20Conference%20\(ANConf11\)/anconf11.pdf](https://www.icao.int/Meetings/AMC/MA/Eleventh%20Air%20Navigation%20Conference%20(ANConf11)/anconf11.pdf)> (accessed 5 February 2024).

⁶ Ibid.

This understanding of UAVs was approved by the ICAO Assembly at its 35th session in 2004.⁷ Due to that, any UAV or pilotless aircraft should be so controlled as to obviate danger to manned aircraft. This highlights the intention of the drafter imposed to the contracting States to measure the foreseeability of risks and measurement of control concerning “due regard” obligations.

During the 38th Assembly meeting presented by the Republic of Korea mentioned in the working paper under item 2 the history of ICAO activities on the development of regulations for RPAs or UAVs.⁸ The Air Navigation Commission (ANC) requested the Secretary-General to consult with several States and international organisations regarding international civil UAV activities that are currently taking place in civil airspace and those that are anticipated, as well as regarding possible procedures for the issuance of special operating permits for civil aircraft. This request was made on April 12, 2005, at the first meeting of the 169th Session.⁹ On May 23 and 24, 2006, the first ICAO exploratory meeting on UAVs was conducted in Montréal.¹⁰ Its goal was to ascertain the potential contribution of ICAO to the establishment of UAV regulations. The group decided that although there would inevitably be plenty of technical and performance standards and norms, only certain items would need to be turned into ICAO Standards and Recommended Practices (SARPs).¹¹

⁷ ICAO, Working Paper Assembly-37th Session, 28 July 2004, <https://www.icao.int/Meetings/AMC/MA/Assembly%2035th%20Session/wp075_en.pdf> (accessed on 5 February 2024).

⁸ ICAO, Working Paper Assembly-38th Session, 20 September 2013, <https://www.icao.int/Meetings/a38/Documents/WP/wp262_rev2_en.pdf#search=169th%202005%20meeting> (accessed on 5 February 2024).

⁹ Ibid.

¹⁰ ICAO, Exploratory Meeting on Unmanned Aerial Vehicles (UAVs), 23-24 May 2006, <https://www.icao.int/safety/acp/Inactive_working_groups_library/ACP-WG-C-11/ACP-WGC11-IP07-UAV.doc> (accessed on 2 January 2020).

¹¹ ICAO, AFI Planning and Implementation Regional Group Sixteenth Meeting (Apirg/16), Progress Report on Unmanned Aerial Vehicle (UAV) Work, 19-23 November 2007, <https://www.icao.int/ESAF/Documents/APIRG/APIRG16/Docs/apirg16ip15_en.pdf> (accessed on 5 February 2024).

3.3 ICAO STANDARDS AND RECOMMENDED PRACTICES (SARPS) - REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) MANUAL (DOC10019)

UAVs are regarded as a new component in the aviation industry. The objective of ICAO in introducing the Standards and Recommended Practices (SARPs) for Remotely Piloted Aircraft Systems (RPAS) is to provide an international regulatory framework supported with Procedures for Air Navigation Services (PANS) and related recommendations are intended to support the everyday operation of RPAS in a way that is safe, consistent, and seamless with manned operations.¹² The Manual on Remotely Piloted Aircraft Systems (RPAS) of 2015 was introduced by the ICAO as a guideline for the legal framework of UAVs.

The main objective is to develop the international regulatory framework of Standards and Recommended Practices (SARPs), procedures, and guidance to facilitate safe, secure, and efficient integration of remotely piloted aircraft (RPA) into non-segregated airspace and aerodromes.¹³ The signatory States are encouraged to use the guidance material related to RPAS provided in the ICAO Doc 10019, consider the developments related to RPAS, and take necessary measures for the amendment of the relevant civil aviation regulations and procedures promptly, to ensure the safe integration of the RPA into the non-segregated airspace.¹⁴ Most of the SARPs' provisions have been adopted and made available under Malaysian rules, which are a part of the international standard accepted by all members.

¹² ICAO Safety, "SARP- Standard and Recommended Practices", <https://www.icao.int/safety/safety_management/pages/sarps.aspx> (accessed on 5 February 2024).

¹³ ICAO, Manual on Remotely Pilot Aircraft Systems, (2015), <<https://skybrary.aero/sites/default/files/bookshelf/4053.pdf>> (accessed 5 February 2024).

¹⁴ Ibid., item 10.3.3.

In addition, the use of UAVs in non-segregated airspace and at aerodromes shouldn't place manned aircraft in any greater danger of accidents.¹⁵ Given the rapid advancement of technology, to assist the Secretariat in coordinating the development of ICAO Standards and Recommended Practices (SARPs), Procedures, and Guidance material for civil UAS; to support the safe, secure, and effective integration of UAS into non-segregated airspace and aerodromes. The SARPs serve as worldwide principles and best practices for UAV regulations, to which contracting States must respond, transplant and implement into national legislation.

3.4 EUROPEAN UNION (EU) REGULATIONS

Although Malaysia is not subject to the European Union (EU) regulations somehow Malaysia has adopted several rules by the EU regarding the legality of UAVs flying in the airspace. EU by European Union Aviation Safety Agency (EASA) has published several rules and directives to affect the operation of UAVs which have now become a trend across the nations since 2018. The EU Commission by virtue of the Treaty on the Functioning of the European Union has regulated UAV regulations which are currently in enforcement which are shown in Table 3.1, and Table 3.2 as follows:

¹⁵ ICAO, Manual on Remotely Pilot Aircraft Systems, (2015), item 10.10.1.

Table 3.1 EASA Implementing Rules (IRs) Commission Regulations¹⁶

Integrated Commission Regulation	Regulation Amendment	Effective Date
Regulation (EU) 2019/947	Initial issue	31/12/2020
Regulation (EU) 2020/639	Amendment 1	2/6/2020
Regulation (EU) 2020/746	Amendment 2	6/6/2020
Regulation (EU) 2021/1166	Amendment 3	5/8/2021
Regulation (EU) 2022/425	Amendment 4	4/4/2022

Table 3.2 Delegated Rules (DRs) Commission Regulations¹⁷

Integrated Commission Regulation	Regulation Amendment	Effective Date
Regulation (EU) 2019/945	Initial issue	1/7/2019
Regulation (EU) 2020/1058	Amendment 1	9/8/2020

An interview with the CAAM officer¹⁸ informed that Malaysia closely followed the EASA regulations, particularly Regulation (EU) 2019/947 and Delegated Regulation (EU) 2019/945. The directives which the CAAM introduced have been adopted from the EASA Regulation (EU) 2019/947 and Delegated Regulation (EU) 2019/945. Therefore, the discussion on EASA Regulations is relevant to this research.

3.4.1 EASA Regulation (EU) 2019/947

This regulation is enforced on 24 May 2019 and provides rules and procedures for the operation of UAVs in the EU region. The preamble mentions that all UAVs irrespective of their weight are allowed to fly within the same European airspace alongside the

¹⁶ EASA, Easy Access Rules For Unmanned Aircraft System, (28 September 2022), <<https://www.easa.europa.eu/en/document-library/easy-access-rules/online-publications/easy-access-rules-unmanned-aircraft-systems?page=2>> (accessed on 7 June 2023).

¹⁷ Ibid.

¹⁸ Muhammad Fadillah Rosli, "interview by Norhusna Emirah Onn", Putrajaya, Kuala Lumpur, 8 September 2020.

manned aircraft whether plane or helicopter. This preamble shows the readiness of the EU to accept UAVs and recognise this technology as important as manned aircraft.¹⁹ Further, the preamble notes that a uniform implementation of and compliance with rules and procedures of the manned aircraft should apply to operators, including remote pilots of the UAVs as well.²⁰

The regulation also expects that the level of required safety of the UAVs is as similar as the manned aircraft to ensure safety for people on the ground and other airspace users during the operations of unmanned aircraft which include the requirement of airworthiness of the UAVs. This regulation further categorised the UAVs into three categories which are open, specific and certified. These categories of UAVs are classified according to the risks of respective UAVs.²¹ The categorization of the UAVs in this regulation enables the operator to prepare the necessary safety procedure as required by the regulation.

3.4.2 EASA Delegated Regulation (EU) 2019/945

The EASA Delegated Regulation (EU) 2019/945 came into force on 12 March 2019 where it covers the guidelines and procedure for the operation of UAVs. This regulation also covers the specific features in mitigating risks pertaining to safety, privacy and personal data.

Further, this regulation requires the manufacturer to label UAVs according to their category to class the UAVs based on risks. This regulation provides comprehensive procedures for all important parties connected with the operation of

¹⁹ Commission Implementing Regulation (EU) 2019/947, preamble 1.

²⁰ Ibid.

²¹ Commission Implementing Regulation (EU) 2019/947, preamble 6, art 3.

UAVs. The provision of the importer is included in this regulation as well as in connection with the manufacturer. On 27 April 2020, the EASA Commission Delegated Regulation (EU) 2020/1058 amended the EASA Delegated Regulation (EU) 2019/945 as regards the introduction of two new unmanned aircraft systems classes to establish a harmonization to Union legislation.

3.5 JURISDICTION AND RELATIONSHIP OF THE FEDERAL AND THE STATE IN COMMERCIAL USE OF UAVS

Malaysia is a unique country moulded with the concept of a constitutional monarch and federalism system. The federalism in Malaysia formally can be seen in the Federation of Malay Agreement (FMA) which was entered between the Malay Rulers and the British Government, dated 21 January 1948. The FMA set there should be a central government to manage the whole nation and further division of powers and jurisdictions between the federal and state governments. Further, the agreement also contained the arrangement that each State would be governed by a Malay officer known as Chief Minister. There was a distribution of powers between the states and the central or federal government in managing the country. Thus, the concept of federalism that Malaysia has now in the Federal Constitution is continuity and adopted from the FMA. The concept of constitutional federalism is more than just a theoretical construct. It is not exclusively normative. Federalism is viewed as a structural process that embodies a sense of collaboration expressed through negotiated cooperation on topics and initiatives based on a willingness to open power and share negotiations.²² Everyone concurs that

²² Begum, T., "Federalism and the Concept of Consociationalism: An Experience in Indian Context", *Indian Journal of Law and Justice*, 13(1), (2022): 393.

federalism should incorporate both structure and process.²³ The state-federal relationship is defined and structured by the Constitution, but it does so through several individual clauses that can all be interpreted and applied differently.²⁴ The relations between the federal and the states are further mentioned in Part VI of the Federal Constitution where articles 74(1) until (4) provide as follows:-

“(1) Without prejudice to any power to make laws conferred on it by any other Article, Parliament may make laws with respect to any of the matters enumerated in the Federal List or the Concurrent List (that is to say, the First or Third List set out in the Ninth Schedule).

(2) Without prejudice to any power to make laws conferred on it by any other Article, the Legislature of a State may make laws with respect to any of the matters enumerated in the State List (that is to say, the Second List set out in the Ninth Schedule) or the Concurrent List.

(3) The power to make laws conferred by this Article is exercisable subject to any conditions or restrictions imposed with respect to any particular matter by this Constitution.

(4) Where general as well as specific expressions are used in describing any of the matter enumerated in the Lists set out in the Ninth Schedule the generality of the former shall not be taken to be limited by the latter.”²⁵

The provision highlights the divisions of jurisdiction for both the central and the states in dealing with the legislative power. In addition, several provisions in List 1 of the Ninth Schedule of the Federal Constitution are relevant to indicate UAVs as a federal matter, as follows:

“10. Communications and transport, including—
(c) airways, aircraft and air navigation; civil aerodromes; provisions for the safety of aircraft;

²³ Begum, 393.

²⁴ Fallon, R., “Federalism as Constitutional Concept”, *Arizona State Law Journal*, 49(3), (2017): 962.

²⁵ Federal Constitution (Malaysia), art 74.

- (d) regulation of traffic by land, water and air other than on rivers outside harbour areas wholly within one State;
- (e) carriage of passengers and goods by land, water and air;
- (f) mechanically propelled vehicles.”²⁶

As stated in Item 10(c), “airways” fall under the purview of the federal government, and it is implied that this authority extends to unmanned aircraft as well. The clause emphasises the word "aircraft," which includes both manned and UAVs implicitly. This directs to the definition under Regulation 2 of the Civil Aviation Regulation 2016 which defines aircraft as a machine that can obtain support in the atmosphere through air response other than air reaction against the surface of the earth. This term applies to manned aircraft and can be extended to UAVs, which can be seen in Regulation 140 until Regulation 144 of the Civil Aviation Regulation 2016. Furthermore, the provision includes the phrase 'air navigation' as a federal jurisdiction. The CAAM now has complete authority over the navigable airspace for manned aircraft, which is established at a minimum of 500 feet over the land's surface. The issue of airways for UAVs, navigable airspace, and the feature of the UAV itself is subject to research gaps, where there is an overlapping power conferred with state jurisdiction. The question at hand here is one of airspace, which, according to Section 44 of the National Land Code 1965, demonstrates the concept of the proprietor's ownership, which encompasses the surface of the land, the beneath, and reasonable airspace. Furthermore, List II of the Ninth Schedule of the Federal Constitution provides land as a part of state jurisdiction.²⁷ The contentious issue here is when the airspace indicated in the NLC is subjective and does not define the actual altitude belonging to the proprietor, creating a difficult issue for UAVs to claim low-altitude airspace.

²⁶ Federal Constitution. (Malaysia), item 10 (c) until (f) list 1 of the ninth schedule.

²⁷ Ibid., item 2, list II of the ninth schedule.

Furthermore, item 10 (d) of the Federal List mentions the federal level's jurisdiction to decide matters concerning "air traffic" for both manned and unmanned aircraft. In addition, the federal level also has a right to make a law for air traffic which can be extended to UAVs in tandem with the mission of the CAAM and the Chicago Convention to integrate air traffic systems and monitor both manned and unmanned aircraft by the year 2035.²⁸ The directives contained standard operating procedures and rules for UAVs established by the CAAM, demonstrating the federal-level commitment to fulfilling their mandate.

Most commercial UAVs are projected to have the mission of transporting items by air. As a result, item 10(e) of List I also applies to the UAV. Item 10(f) further can indicate UAV by looking at the components of the UAVs which are powered by the aerodynamic forces when the engine is turned on and enable the propellers to rotate and fly. It relies on a rotor and propeller to rotate vertically against gravity to pull up the UAV to fly.²⁹ This is sufficient to prove that UAVs are a group of “mechanically propelled vehicles” as well. In brief, as of today, the jurisdiction of federal and state can be illustrated in Figure 3.1 as follows:

²⁸ Norhusna Emirah Onn, “The Principle of Ad Coelum in Respect to the Low-Altitude Airspace for the Commercial Unmanned Aerial Vehicles (UAVs) in Malaysia”, *International Journal of Law, Government and Communication*, 7 (30), (2022): 121.

²⁹ Ctia, “Up, Up and Away: How Do Drones Work?” 12 April 2019, <<https://www.ctia.org/news/up-up-and-away-how-do-drones-work>> (accessed June 16, 2023).

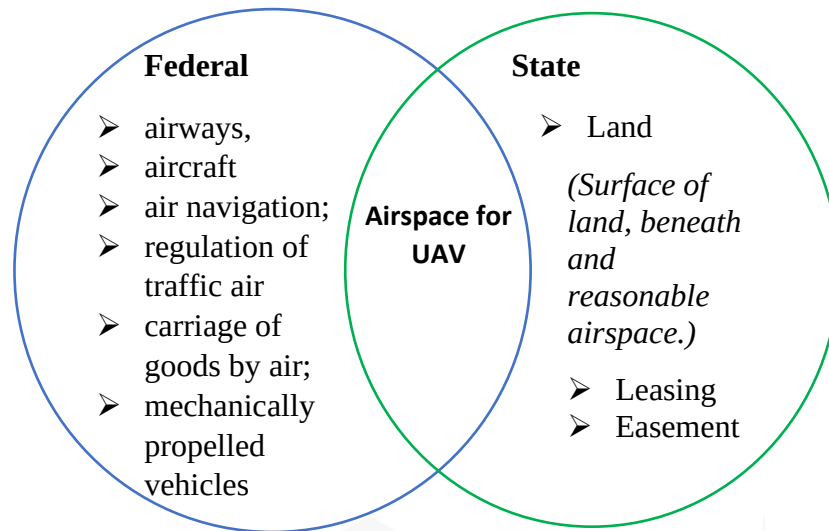


Figure 3.1 Jurisdiction of Federal and State for UAV.

3.5.1 Civil Aviation Act 1969

Malaysia, a party to the Chicago Convention, has enacted the international customary norms into the primary legislation to encourage the universality of UAV laws. The Civil Aviation Act 1969 (CAA 1969), Act Number 3, is a federal legislation enacted in the Parliament which came into force on 27 February 1969. The legislation empowers the Minister to issue regulations as he deems necessary or expedient to give effect to and better carry out the goals and purposes of the Act, to provide generally for civil aviation control in line with the objective of the Chicago Convention.³⁰ Furthermore, CAA 1969 provides the administration, with the general guidelines and procedures for manned aircraft as well as unmanned aircraft. The laws stated in the CAA 1969 apply to both manned aircraft as well as unmanned aircraft. By power confer given under section 3 of the CAA1969, the minister may make rules and subsidiary legislation under the Act to regulate laws under the Act and to affect the objective of the Chicago Convention.

³⁰ Civil Aviation Act 1969 (Act 3), s 3.

This clause provides flexibility in commercial UAV legal regulation from an expert's perspective, which improves the accuracy of risk assessment and UAV technical approach. Therefore, the Civil Aviation Regulations 2016 and other directives for UAVs have been issued by CAAM and come into force to affect this section. Non-compliance with the legislation, circulars, notices, information, and directives is an offence that will result in a fine not exceeding fifty thousand ringgit or imprisonment for a term not exceeding three years (for individuals), and a fine not exceeding one hundred thousand ringgit (for corporations).³¹

3.5.2 Civil Aviation Regulations 2016 [P.U.A 97]

The Civil Aviation Regulations 2016 (CAR 2016) came into force on 31 March 2016 as an extended regulation governing manned aircraft as well as UAVs. This regulation serves as the main law governing UAVs in Malaysia despite other circulars and directives circulated by CAAM for UAVs, especially for commercial UAVs. Several types of UAVs are mentioned in CAR 2016. The small unmanned aircraft defined under regulation 2, is an unmanned aircraft system other than a balloon and kite with a weight of not more than 20 kilograms. In addition, Regulation 2 defines a small unmanned surveillance system as a small UAV that is equipped and capable of data collecting and surveillance. This term implies that the UAVs covered by the Act are those that are mechanically fitted to conduct surveillance and gather data. Even if a kite or balloon is a flying device and is unmanned, the Act does not apply to them because they are not technically designed to gather data or perform surveillance. In other words, an unmanned aircraft system is defined as an aircraft which are operated without a pilot on

³¹ Civil Aviation Act 1969 (Act 3), s 24O.

board.³² The term aircraft is also defined in the CAR 2016 as a machine capable of supporting itself in the atmosphere through air reactions other than air responses against the land's surface.³³ As a result, the word "machine" suggests that kites and balloons are excluded nevertheless subject to the Act. Generally, the term aircraft is referring to both manned and unmanned aircraft for the regulations. The provisions under the regulations could also be referred to UAVs as well.

Additionally, the provisions of UAVs are mentioned in Part XVI of the CAR 2016 which consists of four main regulations starting from regulation 140 until regulation 144. Regulation 140 (1) of CAR 2016 provides that UAVs are prohibited from flying in Class A, B, C and G of airspace,³⁴ and further UAVs shall not fly within of aerodrome traffic zone.³⁵ Classes A, B, C and G of airspace as mentioned in regulation 140(1) (a) refer to the airspace determined by the Director General.³⁶ In addition, the altitude of 400 feet from the surface of the land is set as the maximum height for UAVs to fly in the airspace.³⁷ These prohibitions are not absolute subject to authorization and approval of the Director General. Furthermore, the authorization under regulation 140(1) shall be made in compliance with regulation 189 of CAR 2016,³⁸ which mentions the requirements of application for a permit, licence and certificate. According to CAR 2016 rule 140 (3), the operator or pilot of a UAV must make sure that no attachment, article, or animal fastened to a parachute is dropped from the UAV. In furtherance of this regulation, regulation 137(1) of CAR 2016 mentions a written consent shall be submitted to the Director General for permission to grant

³² Civil Aviation Regulations 2016 [P.U.A 97], reg 2.

³³ Ibid.

³⁴ Ibid., reg 140(1) (a).

³⁵ Ibid., reg 140(1) (b).

³⁶ Ibid., reg 140 (4).

³⁷ Ibid., reg 140(1) (c).

³⁸ Ibid., reg 140(2).

dropping articles or animals from any aircraft. Aircraft here refers to both manned and unmanned aircraft. Nevertheless, such dropping articles and animals with the authority of the pilot in command are not applied to the following circumstances; a) to save a life, b) the jettisoning in case of emergency of fuels or other articles in the aircraft, c) the dropping of ballast in form of fine sand or water, d) the dropping of articles for purpose of navigating aircraft and e) the dropping of an article at the aerodrome of a tow rope, banner or similar articles towed by aircraft.³⁹

The laws related to aerial work by the UAV are mentioned in Regulation 141 of CAR 2016. The general rule of operation of UAVs in aerial work is negative unless the operator or pilot of the UAV grants authorization from the Director General. Such application for a permit to fly UAV for aerial work shall be submitted in accordance with regulation 189 of the CAR 2016. In addition, regulation 136 of CAR 2016 provides any Malaysian aircraft or foreign aircraft operated for aerial work shall obtain an aerial work certificate issued by the Director General.

The exemption to fly UAVs is given only to small UAVs if the operator or pilot is confident that the flight can be conducted and operated safely.⁴⁰ However, such flight or operation by the small UAV shall be conducted within the visual line of sight of the operator or pilot of UAVs which is sufficient to monitor the flight path to avoid collision with aircraft, persons, vessels, vehicles and structures.⁴¹ Nevertheless, the small unmanned surveillance aircraft is prohibited from flying in certain circumstances as follows; a) over designated areas, b) within 150 metres from the designated area, c) over any assembly in the open air attended over 1,000 persons, d) within 150 metres of any assembly in the open air attended over 1,000 persons, e) within 50 metres from

³⁹ Civil Aviation Regulations 2016, reg 137(3).

⁴⁰ Ibid., reg 142(1).

⁴¹ Ibid., reg 142 (2).

structures, vehicles and vessels, f) within 50 metres from any person and g) within 30 metres of any person during take-off and landing; unless granted permission from the Director General as per the regulation 143(1) of the CAR 2016. The application shall be submitted per regulation 189 of the CAR2016. The designated area as mentioned in regulation 143 (1) refers to residential, commercial, industrial and recreation areas.⁴² Small UAVs weighing more than 20 kilograms excluding their fuel are prohibited to fly in the airspace unless granted permission from the Director General.⁴³ The application for such a permit shall be submitted in accordance with regulation 189 of the CAR 2016. In conclusion, the Director General also has the power to suspend, revoke or vary the certificate, licence, permit approval, authorization, permission or other documents issued under the CAR if contravene the terms and conditions as well as contravenes the provisions of the CAA and the CAR, or such issuance of a permit, certificate and licence was obtained by fraud, or due to the incapacity or in event of death and bankruptcy of person or case of a company; in event of its liquidation.⁴⁴

3.5.3 Civil Aviation Directive Part (I) Remote Pilot Training Organization (CAD 6011 Part (I)-RPTO)

This CAD is a subsidiary legislation made under the Civil Aviation Act 1969. It contains the standards, requirements and procedures pertaining to the provisions for Remote Pilot Training Organisations authorised by the CAAM. This directive serves to help the new organizations in the application of remote pilot training as required by the CAAM. Furthermore, this directive highlights the administration arrangement, instruction and

⁴² Civil Aviation Regulations 2016, reg 143(3).

⁴³ Ibid., reg 144(1).

⁴⁴ Ibid., reg 193 (1).

legal matters concerning the administration of RPTO. It also gives guidance to organizations to ensure continuous compliance with the regulations.

The CAAM remote pilot competency scheme consists of two certificates; firstly, ‘A2 Remote Pilot Certificate of Competency’ (A2 RCoC) and secondly, ‘Remote Pilot Certificate of Competency’ (RCoC)’. The A2 RCoC certificate is a theoretical examination for the open category of UAV, while the RCoC certificate is a theoretical and practical examination for the specific category of UAV.⁴⁵ The open category of UAVs is a light operation and usually operates in a visual line of sight while the specific category involves a large operation and usually the commercial UAVs are required to fly beyond the visual line of sight. The CAAM's minimum age criterion for issuing the RCoC-B and its supplemental modules is 18 years old. The CAAM requires 16 years of age as the minimum age to issue an A2 RCoC.⁴⁶ These examinations are indications of the competency of the operator or pilot to fly the UAVs.

This directive will serve as a legal framework for any organisation conducting training or teaching or authorizing anyone to conduct an exam or test for an RCoC without first having a valid RPTO Certificate of Approval (COA) granted by the CAAM and in compliance with this CAD.⁴⁷ The provisions and requirements for RPTO staff also are highlighted in this directive, where the instructor who is responsible for delivering theoretical knowledge must possess experience, knowledge and competence and shall demonstrate his capability to perform technical and administrative tasks linked with the assessment process.⁴⁸ In addition, an RPTO should have access to facilities appropriate to the size and scope of the intended operations provided in an environment

⁴⁵ Civil Aviation Directive Part (I) Remote Pilot Training Organization (CAD 6011 Part (I)-RPTO), item 1.4.7.

⁴⁶ Ibid., item 4.1.1.

⁴⁷ Ibid., item 3.1.1.

⁴⁸ Ibid., item 3.12.4.

conducive to learning including office space for administration, library facilities, storage area, emergency response room, classroom, examination hall and practical training area.

3.5.4 Civil Aviation Directive Part 6011(II) Agriculture UAS Operations (CAD 6011 Part (II) -UAS AGR)

This CAD Part 6011 (II) is a subsidiary legislation which comes into operation on 1st March 2021. The purpose of this directive is to facilitate the operation of UAVs in agriculture which is currently in high demand in the industry.⁴⁹ It acknowledges the initiative of CAAM in facilitating the needs of commercial UAVs in Malaysia and upholds the principles of the Chicago Convention as well. This directive contains the standards, specifications, and guidelines for individuals and operators in Malaysia seeking approval for agricultural operations using UAV under part of Regulation 136 and is read in conjunction with Regulation 141, and the event that the UAV weights more than 20 kilogrammes, be read together with Regulation 144 of the Malaysian Civil Aviation Regulations. Most of the provisions under this CAD highlight the safety requirements for agriculture UAVs in terms of operational standards and airworthiness of the UAV. Noncompliance with any provision under this CAD will be liable to punishment under section 24O (2) of the CAA 1969. This is seen as an honour for the agriculture sector, as CAAM recognises the value of UAV operations in the business. This directive acts as a springboard for commercial UAVs to expand into other sectors.

The CAD Part II is not applicable for the operation of agriculture UAV if the UAV has a characteristic dimension of three metres or more which is designed to fly

⁴⁹ Civil Aviation Directive Part 6011(II) Agriculture UAS Operations (CAD 6011 Part (II) -UAS AGR), item 1.4.1.

over the assembly of people or the UAV is designed for carrying people, or the UAV is intended for the transportation of dangerous commodities, which need a high level of robustness to reduce the risks to third parties in the event of an accident.⁵⁰ Item 14.1.1 of the CAD 6011 (Part II) an agricultural UAV operation is when a UAV is used to disperse any agricultural payload intended for plant nutrition, soil treatment, plant propagation, or pest control; or engage in surveillance activities directly affecting agriculture, cultivation, or forest preservation, with the exception of the dispersal of live insects. UAVs operating in Malaysia are required to adhere to at least similar safety and operational standards as manned aircraft when operating the same type of operation in the same airspace.⁵¹ Thus, the operation of agriculture UAVs shall not expose a greater hazard to persons, vehicles, vessels, properties and animals either in the air or on the ground.⁵² The principle of “See and Avoid” is implemented in this directive for the agricultural UAV similar to the principle of “Detect and Avoid” for manned aircraft.⁵³ This principle is a fundamental rule of flight which allows the UAVs to perceive, sense, and recognise hazards while also incorporating safe strategies to prevent a collision.

Flying objects like paper aeroplanes, Frisbees, darts, thrown toys, and hand launcher gliders are excluded under the definition of aircraft under this directive. The word unmanned aircraft is defined as a flying machine which is operated with no pilot on board. This definition gives comprehensive explanations concerning the operation of UAVs.⁵⁴ This directive provides an extended definition to exclude various forms of flying objects that are not mechanically constructed. Only mechanically constructed

⁵⁰ Civil Aviation Directive Part 6011(II) Agriculture UAS Operations (CAD 6011 Part (II) -UAS AGR), item 1.2.1(a-c).

⁵¹ Ibid., item 1.5.1.

⁵² Ibid., item 1.5.2.

⁵³ Ibid., item 1.5.4.

⁵⁴ Ibid., item 1.6.1.

UAVs are covered by this regulation. Furthermore, Batteries and "charge" are treated as components of the aircraft for electrically powered unmanned aircraft, respectively.

3.5.5 Civil Aviation Directive 6011 Part (V) – Unmanned Aircraft System Special UAS Project- (CAD 6011 Part (V) – UAS SUP)

The Civil Aviation Directive 6011 Part (V) is a guideline and procedure for special project UAVs other than agriculture UAVs. This directive offers a standard requirement to both individual and commercial UAV operators where the operation of UAVs is within the ambit of a “Special UAS Project.”⁵⁵ The CAAM has classified several UAVs as the Special UAS Project if the operation involves; a) Carriage of items, including transportation of dangerous goods; b) BVLOS; c) Research and Development; d) Any other operations that necessitate additional operational support from the CAAM due to the additional risks they entail.⁵⁶ The operation of commercial UAVs with a broad scope of operations mostly involves the carriage of items that would definitely be within the definition of the Special UAS Project. Despite the general categorization mentioned in this directive on Special UAS Project, there are several restrictions where this directive is not applicable if the operation is conducted falls under the following criteria; a) the UAV has a dimension of three metres or more and is designed to fly over assemblies of people, b) if the UAV is designed to transport people, this may be referring to a flying car; c) it is intended for the transport of dangerous commodities, which necessitates a high level of robustness in order to reduce the risks to third parties in the event of an accident. Further, this directive has excluded indoor operations within the scope of the Special UAS Project. Indoor operations are defined as operations within closed space

⁵⁵ Civil Aviation Directive 6011 Part (V) – Unmanned Aircraft System Special UAS Project- (CAD 6011 Part (V) – UAS SUP), item 1.2.1 & item 1.4.2.

⁵⁶ Ibid., item 1.2.2.

and limited space where the degree and likelihood of the UAV escaping outside airspace are very low.⁵⁷

Furthermore, for additional safety requirements to mitigate risks and avoid hazards, the Unmanned Traffic Management (UTM), competent personnel, and robust organisation of operators to ensure Emergency Response Plan and Recovery Scheme (ERP) shall be adopted by the operators as additional safety measures before operations.⁵⁸ It is the general policy in aviation that UAVs operating in Malaysia are required to adhere to at least similar safety and operational standards as manned aircraft when performing the same type of operation in the same airspace.⁵⁹ Thus, the proximity of safety of UAVs shall not create a hazard to persons, property, vehicles and vessels either on the ground or in the air.⁶⁰ All Special UAS Project activities are required to obtain a valid Special UAS Project Approval issued by CAAM as required by this directive. The coordination of the manufacturer of UAVs with regard to the Special UAS Project is essential for the certification of airworthiness.

3.6 ENFORCEMENT IN THE INTERNATIONAL LEVEL: INTERNATIONAL CIVIL AVIATION ORGANIZATION

The United Nations (UN) specialized entity in the aviation industry is the International Civil Aviation Organization (ICAO). The goal of its work is to provide a stable, effective, clean, economically sustainable, and environmentally responsible civil aviation sector globally for both manned aircraft and unmanned aircraft. ICAO is

⁵⁷ Civil Aviation Directive 6011 Part (V) – Unmanned Aircraft System Special UAS Project- (CAD 6011 Part (V) – UAS SUP), item 1.4.6.

⁵⁸ Ibid., item 1.4.6.

⁵⁹ Ibid., item 1.5.1.

⁶⁰ Ibid., item 1.5.2.

supported and directed by 193 national governments to fund their diplomacy and cooperation in air transport as signatory states to the Chicago Convention (1944).

The initiative of ICAO in the development of regulations for UAVs has been tremendously consistent since 2005. On 15th August 2005, there was a proposal made by Spectrum Frequency Consultation Group (submitted by Eurocontrol Agency) for the future spectrum requirements for UAVs. This group was to assist ICAO in support of future UAV initiatives, and airworthiness regulations on UAVs. The objective of this proposal was to allow routine and safe flying of UAVs around Europe in controlled airspace under the auspices of conventional Air Traffic Control (ATC) for future UAVs.⁶¹

Followed on 23 to 24 May 2006, an ICAO Exploratory Meeting on Unmanned Aerial Vehicles (UAVs) was held at ICAO Headquarters in Montreal. The key objective of the meeting was to examine the current state of affairs concerning the development of UAV-related regulatory materials and to address the potential role of ICAO in the regulatory process. The findings of the meeting would be used by the Secretariat as the basis for the preparation of a report to the ICAO Air Navigation Commission (ANC) along with recommendations for the ICAO work program. The discussions established the following crucial issues that had to be discussed and addressed related to UAV activity: 1) Certification: airframes, operating, continuing airworthiness, training institutions, maintenance organizations, manufacturers, and air navigation services providers for UAV operations; 2) Licensing: Operator qualifications, Medical fitness and Mutual recognition; 3) Regulations: Safety oversight, Terminology, Common standards to serve as the basis for national regulations, Operating permits, Air traffic

⁶¹ ICAO, Working Paper Aeronautical Communications Panel (ACP) Fourteenth Meeting Of Working Group F, 22 – 26 August 2005, <<https://www.icao.int/safety/acp/ACPWGF/ACP-WG-F-14/ACP-WGF-IP2-SFCG UAV.doc>> (accessed 2 January 2021).

services requirements, Accident investigation and Carriage of dangerous goods; 4) Technical issues: Frequency spectrum, Common approach to “sense and avoid”, Datalink issues for communication and surveillance and Separation minima; 5) Human factors issues; 6) Public acceptance; 7) Environment; and 8) Security. The International Telecommunications Union (ITU) was given responsibility concerning frequency spectrum issues for UAVs during the conference.⁶²

ICAO constantly year by year discussing new agendas for the development of the regulatory framework for the safe use of UAVs. The main objective of ICAO in the field of unmanned aviation is to provide the basic regulatory structure through Standards and Recommended Practices (SARPs), with support for Air Navigation Services Procedures (PANS) and guidance content, to support the routine international activity of unmanned aircraft systems (UAS) worldwide in a secure, harmonized and integrated way analogous to that of the manned operation. In 2015, ICAO introduced the Remotely Piloted Aircraft Systems (RPAS) Manual (Doc10019), which describes ICAO's vision of RPAS as an equal partner in the civil aviation system, essentially capable of communicating on a real-time basis with air traffic control (ATC) and other aircraft which focus on the Standards that will be developed the integration of RPAS operating following instrument flight rules and at controlled aerodromes for the next 5 to 10 years.

Furthermore, the Remotely Piloted Aircraft Systems Panel (RPASP) was established by ICAO and is considered a voluntary workforce with collaboration with various groups of experts around the world nominated by States and International organizations to coordinate and develop ICAO Standards and Recommended Practices

⁶² ICAO, ICAO Exploratory Meeting On Unmanned Aerial Vehicles (UAVs), 23 and 24 May 2006, <https://www.icao.int/safety/acp/Inactive_working_groups_library/ACP-WG-C-11/ACP-WGC11-IP07-UAV.doc> (accessed 2 January 2020).

(SARPs), Procedures, and Guidelines for UAVs to facilitate the safe, secure, and efficient integration of UAVs into non-segregated airspace and aerodromes. It was agreed that ICAO should function as a central focus for worldwide interconnectivity and harmonisation, develop a regulatory framework, coordinate the creation of UAV SARPs, assist in the creation of technical specifications by other organisations, and specify communication requirements for UAV activity.

3.6.1 European Union Aviation Safety Agency (EASA)

The European Union Aviation Safety Agency is an agency of the European Union with jurisdiction for civil aviation safety. It was established on 15th July 2002 with headquarters in Cologne and fully functioning in 2008. The Agency's tasks include evaluating and analyzing security criteria, approving international operators, and providing guidance to the European Commission on the drafting of EU legislation. It also enforces and tracks safety rules, certification, and airworthiness of aircraft and is engaged in the design, manufacture, and maintenance of aeronautical products including UAVs.

With regard to UAVs, the EASA has introduced several policies for its members. EU Regulations 2019/947 and 2019/945 set out a policy for the secure operation of UAVs in the European skies. These regulations follow a risk-based approach and, regardless of the type of UAV, it does not distinguish between leisure activities and business activities. The weight and the purpose of operation are the essential elements in considering the permit. EU Regulation 2019/947 outlines the types of operation and their levels of risk by defining UAVs into three categories of operations: the open, the specific, and the certified.

Far more than that, the management of traffic for UAVs via U-space will be established by EASA to provide safety not only to the public but also to manned aircraft by integrating air traffic control with the operation of manned aircraft. Supported by clear and simple rules, the U-space regulatory framework should permit safe aircraft operations in all areas and for all types of unmanned operations. The U-Space regulatory framework is presently under discussion, with publication planned for 2021.⁶³

The regulations and policies brought by the EASA could be the perfect and comprehensive regulations for Malaysia to adopt and transplant into the national law. Civil Aviation of Malaysia proposes to use EU Regulations 2019/947 and 2019/945 as the main guidelines for the operators of UAVs in Malaysia. This could give the foreign operator the leniency to fly the UAV in Malaysia because, according to CAAM, if they follow and comply with the requirements of the EASA regulations in their home country, they can therefore automatically fly their UAV in Malaysia.

3.6.2 The International Air Transport Association (IATA)

The International Air Transport Association (IATA) represents some 290 airlines, or 82% of total air traffic, and is the trade association for world airlines, was established on 19 April 1945 in Havana, Cuba. IATA had 57 members from 31 nations at its formation and many are from Europe and North America. It presently has some 290 members in every part of the globe from 120 nations.⁶⁴ They facilitate many fields of activity in aviation and help to implement industry policies on crucial aviation issues.

One of the crucial discussions in IATA is unmanned cargo issues. IATA recognises the exhaustive function of this new mode of air freight of UAV in

⁶³ EASA, Civil Drones (Unmanned aircraft), <<https://www.easa.europa.eu/si/domains/civil-drones>> (accessed 5 January 2021).

⁶⁴ IATA, “The Founding of IATA”, <<https://www.iata.org/en/about/history/>> (accessed 9 January 2021).

commercial perspectives as well as in other services such as last-mile air transport, humanitarian supplies, disaster relief, temperature-sensitive medication and food transport, and many more. The goal of IATA is to address the potential for the air freight industry to incorporate and adopt this new branch of air freight by developing the requisite standards and resources, developing training programs, and collaborating with industry partners.⁶⁵ To ensure the secure and successful deployment of Unmanned Aircraft Systems (UAS) into shared airspace, IATA has also worked closely with ICAO, civil aviation authorities, and other key industry partners in establishing legal frameworks and regulations for the operational guidelines of UAVs.

3.7 ENFORCEMENT AND ADMINISTRATION MECHANISM OF COMMERCIAL UAVs IN MALAYSIA

The operation of commercial UAVs involves a holistic integration of all government agencies in facilitating the requirements of permits, certificates and licences for operation. The jurisdictions of federal and state governments also are subject to the availability and declaration of navigable airspace for the UAVs. The current situation right now is ambiguous thus a holistic integration in all agencies including the municipal councils is required in recognising the commercial UAVs to fly into low-altitude airspace. Each commercial operation requires different enforcement and administration mechanisms for the smooth running of the system. The time and duration are the biggest challenges for UAV operators and pilots in the application for permits, licences or certificates as they have to deal with different agencies with different requirements.

⁶⁵ Brett, D., “Dronamics Secures IATA and ICAO Codes”, *Air Cargo News*, 13 July 2023 <<https://www.aircargonews.net/airlines/drones/dronamics-secures-iata-and-icao-codes/>> (accessed on 23 August 2023).

Thus, it is appropriate to have an integration of the system for the application of certificates, permits or licences for commercial UAVs. Consequently, it may attract investors and boost the Malaysian economy due to the efficiency and integration of the system for commercial UAVs. The CAAM is the primary agency in charge of handling unmanned aircraft-related issues from the time of registration to the end of the operation. Meanwhile, several government agencies will act as enforcing authorities during the registration of permits or licences. Currently, there are several important government bodies and agencies in Malaysia administer the regulations affecting UAVs which are shown in Figure 3.1 as follows:

Department of Civil Aviation Authority of Malaysia (CAAM)				
Royal Malaysia Police (RMP)	Malaysian Communication and Multimedia Commission (MCMC)	Chief Government Security Office (CGSO)	Department of Survey and Mapping Malaysia (JUPEM)	Standard and Industrial Research Institute of Malaysia (SIRIM)

Figure 3.2 Enforcement and Administration Agencies for UAVs law in Malaysia.

3.7.1 Department of Civil Aviation Authority of Malaysia

The Civil Aviation Authority of Malaysia (CAAM) is the main body responsible for overseeing and implementing laws on both manned and unmanned aircraft involving UAVs. The Malaysian Civil Aviation Authority, formerly known as the Department of Civil Aviation (DCA), is a government agency established in 1969 under the Malaysian Ministry of Transport. DCA was effectively incorporated into a statutory agency known as CAAM on 19 February 2018. The DCA role is currently being exercised by the CAAM. The implementation of the CAAM is consistent with the provision of the International Civil Aviation Organization (ICAO), which called upon the Contracting States to create an independent civil aviation authority to ensure the efficient management of civil aviation safety and security. As Malaysia's sole civil aviation technical regulator, CAAM seeks to ensure effective management of the safety and security of civil aviation.

The CAAM being the regulator for the UAV also has other functions to entertain any application for the operation of the UAV from private to government agencies to fly the UAV within visual line sight (VLOS). The application by the Government Agencies to Conduct AdHoc UAS Operations must be supported and approved by CAAM. the conduct of ad-hoc UAS operations by government agencies, municipal authorities, law enforcement agencies, and/or local security institutions are usually for law enforcement, surveillance, and/or other relevant public interest protection activities in Visual Line of Sight (VLOS) and/or Extended Visual Line Sight (EVLOS). As of 3rd November 2020, the CAAM has confirmed that there are two main regulations applicable for the UAV; 1) Civil Aviation Regulation 2016 and, 2) Aeronautical Information Circular 04/2008.

3.7.2 Royal Malaysia Police

In Malaysia, the Royal Malaysia Police (often abbreviated as RMP) is a uniformed federal police force. The Civil Aviation Authority of Malaysia (CAAM) has empowered the RMP to perform comprehensive operations with UAVs. The RMP has deployed unmanned micro and small class aircraft systems (UASs) to assist them in the enforcement, surveillance, and patrolling system. The RMP has established a new unit called the Drone Unit that has jurisdiction not only to conduct surveillance and patrolling but also has the power to deactivate any unauthorized UAV that violates the rules and regulations of UAV. Aerial surveillance and the use of UAVs in integrated patrols under the national operation codenamed 'Ops Benteng' were reported to minimize the workload of members of the General Operations Force (GOF) to combat smuggling activities along the Malaysia River.⁶⁶ Further, the RMP also has jurisdiction as the enforcer and an authorized officer in protecting the safety and security of the nation as per the Protected Area and Protected Places Act 1959,⁶⁷ which includes the prohibition of flying UAVs in the protected area.

3.7.3 Malaysian Communication and Multimedia Commission (MCMC)

UAVs communicate by using a specific radio frequency called a band. This radio electromagnetic frequency is invisible waveforms that are measured in hertz (Hz). Usually, UAVs will use radio frequencies that range from around 20 kilohertz (kHz) to 300 gigahertz (GHz).

⁶⁶ Bernama, "Air Unit, Drones Help Out GOF Patrols Along Border", *The Star*, 28 November 2020, <https://www.thestar.com.my/news/nation/2020/11/28/air-unit-drones-help-out-gof-patrols-along-border-says-3rd-battalion-co>.

⁶⁷ Protected Area and Protected Places Act 1959 (Act 298), s 3.

The International Telecommunication Union (ITU) is the United Nations Specialized Agency based in Geneva, Switzerland, and is a member of the United Nations Development Group. The ITU is responsible for coordinating the shared global use of the radio spectrum including UAVs. Since its inception, the ITU has had a standardization mission, currently also promoting work to enhance telecommunication infrastructure in the developing world, helping to establish and organize global technological standards.⁶⁸ Currently, the ITU has 193 member states that are divided into six regional groups, and Malaysia is a member of ITU. Standards named "Recommendations" are issued by the ITU-T Telecommunication Standardization and the ITU-R Radio communication Sectors, which move through technical research and focus groups, following a formal process of revision and approval. Ultimately, when approved, implemented, and transplanted as part of national legislation, guidelines become obligatory. For example, if any IEEE802.11,⁶⁹ protocol is indicated to be followed by a radio communications product, then all its technical rules must be followed. The ability to harmonize radio frequencies with equipment and devices is a major advantage for the industry. The value for the end-user/buyer is to have access to an open market for technology, made accessible to many brands, able to integrate, and at lower prices.⁷⁰

The type of radio signal for the UAV used is the up and down Control & Command (C2) link. This C2 link is usually used by the flight telecommand and for flight telemetry.⁷¹ The "Payload Communications Link" is the other significant element

⁶⁸ TWEVO Ltd, "Radio Regulation for Drones. How REVOsdr Untangles a Tangled World v.2", (2017) <https://www.twevo.net/wp-content/uploads/2017/11/White-Paper-REVOsdr_DroneRadioRegulation_V2_sml.pdf> (accessed on 23 August 2023).

⁶⁹ IEEE802.11b specifies the operation band (within the 2.4 GHz license-free band, defined by "Regulation"), number of channels and bandwidths, channel overlapping, and modulation scheme, among many other technical specifications.

⁷⁰ TWEVO Ltd, 3.

⁷¹ It is used between Air Traffic Control with the pilot.

in the radio signals between the UAV and the pilot. This involves unique information that is obtained by the UAV during the flight. Very often, this complex sensor data is legit, such as visual or thermal images, still or moving.⁷²

As in Malaysia, approval shall be granted for the radio frequency used for flying the UAV. Any UAV regardless of its weight shall get approval from the Department of Civil Aviation Malaysia (DCA) and the Communications and Multimedia Commission (MCMC) for radiofrequency and sensors. The Malaysian Communication and Multimedia Commission has confirmed that the radio communication equipment used by UAV shall follow and adhere to the specified technical parameters set by the Commission as per the Second Schedule of the Class Assignment.⁷³ Section 169 of the Communication and Multimedia Act 1998, provides that the Commission may issue a class assignment that grants any person the right to use any frequency band or band for a defined purpose.⁷⁴ The Class Assignment shall be consistent with the spectrum⁷⁵ plan developed by the Commission for the respective device.⁷⁶ A spectrum plan shall specify how the spectrum is to be used and the methodology for spectrum allocation and reassignment shall be specified.⁷⁷

There are three categories of radio frequencies for UAVs; 1) for radio frequencies from 433.00 MHz to 435.00 MHz the maximum equivalent isotropically radiated power is 100 mW, 2) for radio frequencies from 2400.00 MHz to 2500.00 MHz the maximum equivalent isotropically radiated capacity is 500 mW, and 3) for radio

⁷² *TWEVO Ltd*, 5.

⁷³ 'Assignment' means the assignment by the Commission of rights relating to the use of bandwidth, numbers or electronic addresses, which may include provisions which are subject to the exercise of those rights.

⁷⁴ Communication and Multimedia Act 1998 (Act 588), s 169.

⁷⁵ *Ibid.*, s 6 interprets 'Spectrum' as the continuous range of frequencies of electromagnetic waves up to and including 420 terahertz frequency.

⁷⁶ Communication and Multimedia Act 1998, s 170.

⁷⁷ *Ibid.*, s 173.

frequencies from 5725.00 MHz to 5875.00 MHz the maximum equivalent isotropically radiated power is 1W. The operator of the UAV shall get prior approval from the Commission for the usage of the radio frequencies technical parameter. The operation of UAV under the Class Assignment shall not be covered against intervention and shall not be conducted in violation of the Communication and Multimedia Act 1998, thus jeopardizing the life and safety of the public, property, and animals. Besides, UAVs mounted with a Class Assignment shall also be accredited in compliance with the Communication and Multimedia (Technical Standards) Regulation 2000 by the Commission or its licensed certifying agency and display the label of certification as authorized by the Commission.⁷⁸

3.7.4 Chief Government Security Office (CGSO)

The Chief Government Security Office or CGSO is an agency under the Malaysian federal government's Prime Minister's Department, responsible for providing security protection to all government assets and properties. The main task of CGSO is to provide protective security advice to State Governments, Ministries, Departments, and government agencies to help maintain the level of physical security, document security, and personnel security in all government agencies set by the government from time to time to protect against espionage and sabotage as well as from the leakage of unauthorized information from all Government Departments and agencies.

Concerning UAVs, CGSO is also responsible for granting a permit for the operator of the UAV by providing conditions not to fly the UAV in the prohibited and restricted area as per list by the CGSO and per Gazette as mentioned in section 6 of the

⁷⁸ *Malaysian Communication and Multimedia Commission*, "Notice: Use of Frequencies for Unmanned Aircraft Systems", 2 December 2015, <<https://www.mcmc.gov.my/en/media/announcements/notice-use-of-frequencies-for-unmanned-aircraft-s>> (accessed 30 December 2020).

Protected Areas and Protected Places Act 1959 (Act 298). The operator must acknowledge and understand the restrictive and prohibited areas that have been promulgated by the Chief Government Security Office for the safe flying and operation of UAVs.

3.7.5 Department of Survey and Mapping Malaysia (JUPEM)

The Department of Survey and Mapping of Malaysia (JUPEM) is one of the first agencies in Malaysia to carry out survey and mapping activities that began when the Johor Survey Department was formed in 1885. Today, JUPEM is an agency under the Ministry of Land and Natural Resources responsible for surveying and mapping activities in the country and is entrusted with such activities to safeguard the sovereignty of the country.

JUPEM shall ensure quality and integrated geospatial defence services in supporting defence infrastructure and national security are protected. Due to the ability of UAVs can capture and record pictures and footage from the above sky, the operation of the UAV for surveying and mapping by JUPEM becoming more accurate and reliable for the country. However, the operator of a UAV either for private or commercial users needs to apply for a permit from the Department of Survey and Mapping Malaysia (JUPEM) if any sensors are used for data collection or aerial imaging for both less than 20 kilograms and more than 20 kilogrammes UAVs. Detailed maps of where the UAV will be flown and other information about the aircraft had to be submitted by applicants. The rationale behind the application is to avoid interruption and JUPEM will notice that another UAV is in operation at the approval places. It could be also for the security of Malaysia to avoid intelligence by a private and unauthorized person from the sky of Malaysia. JUPEM is also wholly responsible for aerial photography within the scope of

mapping activities. All forms of aerial photography are primarily supervised by this department for safety purposes. In brief, any operator planning to take any form of an aerial picture should also apply for approval from the department. The operator of the UAV shall take necessary precautions to apply permit and approval letter for mapping, aerial photography, filming, and videography activities from the Department of Survey and Mapping Malaysia (JUPEM).

3.7.6 Standard and Industrial Research Institute of Malaysia (SIRIM)

SIRIM QAS International is a registered Certifying Agency (CA) by the Malaysian Communications and Multimedia Commission (MCMC). It offers Compliance Approval based on Product Certification System (ISO/IEC 17065) according to the Communications and Multimedia Act (CMA) 1998, and the Communications and Multimedia (Technical Standards) Regulations 2000.⁷⁹

All communications equipment (apparatus) must be accredited in compliance with Regulations 2000 [P.U(A)124] on communications and multimedia (technical standards) that include all communication devices that are imported, manufactured, distributed, or sold in Malaysia. All certified communication equipment bears a mark or label for certification. The Commission has registered SIRIM QAS International as the Certifying Agency for the category of communications equipment.⁸⁰

The UAV shall have proper documentation including the SIRIM certification to certify that the UAVs are safe to use and fly. SIRIM certification gives the holder the

⁷⁹ SIRIM QAS International Sdn. Bhd, “Certification Requirements for Compliance Approval on Communication, Multimedia and Hybrid Equipment”, *Communication and Multimedia Certification Section*, <https://www.sirim-qas.com.my/wp-content/uploads/2012/04/TAC_DOC_01-1-1-Issue-1-Rev-0-CERTIFICATION-REQUIREMENTS-As-registered-with-TECS.pdf> (accessed on 23 August 2023). See more in point 1.4.

⁸⁰ Ibid.

responsibility and obligations to ensure that the necessary quality control is maintained and that certified equipment is consistent with the scope of certification, specifications, procedures, regulations, and the applicable regulatory provisions and Acts. To signify its compliance, the Certificate Holder shall display the Certification Mark or Certification Marking on certified equipment.⁸¹ The certification mark or certification label shall be generated utilizing the Self Labelling Program (SLP) whereby the holder of the certificate shall obtain the SLP ID and register the serial number of the UAV before importation or releasing the UAV on the standardization market.⁸² The UAV that operates outside the allowable frequency band and not as per the designated application as stated in the Technical Code or Class Assignments Spectrum Plan or Standard Radio System Plan (SRSP) shall refer to MCMC for frequency clearance.

Furthermore, according to SIRIM guidelines, any communication system operating in frequency bands specified for other services for example cordless telephone or CCTV operating in the 900 MHz bands, UAV operating in GSM bands, government bands, and others are deemed to be a prohibited object for importation.

3.8 EVALUATION AND CONCLUSION

To summarise, CAAM has taken significant steps in providing laws and regulations for UAVs similar to Article 8 of the Chicago Conventions and the ICAO to have a set of uniform laws that can offer guidelines and safety procedures to avoid hazards to the public, property, vehicles, vessels, and even animals. CAAM has issued many Civil Aviation Directives to promote commercial UAVs to offer technological services in response to market needs. There are currently different types of commercial UAVs that

⁸¹ SIRIM QAS International Sdn. Bhd, point 13.2.

⁸² Ibid., point 1.6.

offer various services and; at the same time carry various risks and obligations. Different sets of directives are suited for different types of operations. Currently, the Civil Aviation Directive Part 6011(II) Agriculture UAS Operations provides guidelines exclusively for agricultural UAV operations. Hopefully, further directives or legislation will be introduced in the near future to cater to the use of the types of payloads and commercial UAV operations.

Apart from CAAM, which is the primary actor in the administration of the law governing UAVs, other government entities are also in charge of measuring the availability of UAVs depending on their functions and operations. It is suggested that for efficiency purposes, all authorities should be placed under one roof so that the application for a permit or licence for commercial UAVs does not take too long due to technical requirements from different agencies. Because the term commercial implies that time is of the essence in a contract, obtaining permission or licence from such agencies should be faster and easier.

CHAPTER 4

USE OF AIRSPACE FOR COMMERCIAL PURPOSES IN MALAYSIA AND ITS IMPLICATIONS

4.1 INTRODUCTION

This chapter focuses on the legal regime governing airspace in Malaysia. The research further examines the existing law of airspace to be applied in the context of UAVs, particularly commercial use. The established principle of *ad coelum* presently highlights the use of airspace by manned aircraft but in this chapter, the researcher does an in-depth analysis of the extent of the *ad coelum* principle to be applied to the commercial use of UAV. The segregation of airspace by altitude is also relevant in determining the rights of low-altitude airspace for commercial UAVs. Besides, the controversial issues related to the proprietor's ownership over the airspace also are highlighted in this chapter. The analysis and discussion of aerial trespass and nuisance also reflect the implications of the main idea of this chapter.

Furthermore, this chapter analyses the existing law available in state legislation that highlights the application for a permit for use of airspace which is currently in practice for an application to hang a billboard. However, the provisions of the laws may be used for the application of the use of airspace by the commercial UAV in case the UAV fly in the state land or reserved land.

Another method to legalise the use of low-altitude airspace for the UAV is by using the several existing transactions available under the National Land Code which are by leasing the low-altitude airspace and by application of avigation easement.

Another extreme part of realising the right of way for commercial UAVs is by adopting the law in land acquisitions. This chapter further discusses the concept of low-altitude airspace from the Islamic perspective where the concept of *mawat* land could be extended to the low-altitude airspace for commercial UAVs.

4.2 AD COELUM PRINCIPLE FOR THE UAV AIRSPACE

The growth of the aviation industry started from manned aircraft to unmanned aircraft and has affected the utilization and usage of airspace. Generally, airspace is one area considered to be undiscovered due to the nature of airspace being spacious. Airspace involves aerial navigation with different layers of atmospheres. It is established law, that airspace incapable of being inhabitants is free territorial. The right to airspace is attached to the exclusivity of enjoyment of the proprietor in owning the property. Thus, the principle of *ad coelum*¹ highlights the proprietors own not only the surface of the land but also the skies above as well as the depth underneath their surface land. The aircraft operator, on the other hand, contended that the adjacent owner had neither ownership nor exclusive right to the airspace. The ancient doctrine of *ad coelum* was developed in pre-aviation to protect the proprietor's rights from trespass and nuisance. In this 21st century, the aviation industry has to split the clouds and claim its rights of way and usage in the airspace. Historically, the owner of land possessed ownership rights over the land's surface as well as unlimited above and below. Conversely, the rules of the law, as well as the provisions of other legislation, have restricted these unlimited rights. Until today, people are still wondering how far these property rights are above their rooftops because the law did not state clearly the limitations and the

¹ The ancient maxim "*cujus est solum ejus est usque ad coelum*" means all the space above and below a proprietor's property was his or hers.

exact altitudes of the right of airspace of individuals. It remains blank until today and is open for further interpretation. Thus, the right or ownership of airspace cannot be interpreted literally.

Section 44(1) (a) of the National Land Code 1965,² provides the extent of exclusive use of the proprietor over the rights and enjoyment of land which includes the surface of the land, the airspace as well as beneath the land. The limitation of the right to use airspace is mentioned in section 19(1) of the Civil Aviation Act 1969 (Act 3):

“No action shall lie in trespass or in respect of nuisance, by reason only of the flight of aircraft over any property at a height above the ground, which, having regard to wind, weather, and all circumstances of the case, is reasonable.”³

The word ‘reasonable’ is open to the judicial interpretation of which altitude would constitute reasonable. The effect of section 19 is to limit the floodgate civil claim by the proprietor of the land to sue for access into the airspace above his land and for any noise, vibration, or other nuisance resulting from the lawful flight of aircraft above that land.

Seven layers of atmosphere here are in the question of law when it comes to the right of airspace. Airspace classification has been applied in Malaysia and all over the world in conformity with the ICAO Standards and Recommended Practices. There are two types of flight for manned aircraft as established by the ICAO which are; 1) The Instrument Flight Rule (IFR) and, 2) The Visual Flight Rule (VFR). These types of flights are to ensure the competency of the aircraft to fly in the classes of airspace. The

² National Land Code 1965 (Act 56), s 44(1) (a).

³ Civil Aviation Act 1969 (Act 3), s 19(1).

IFR is a special aircraft where it permits the aircraft to fly and operate within meteorological conditions. The pilots shall have and prepare a pre-planned flight route before the take-off. The deviation is allowed in case of emergencies, bad weather, and so on. The VFR has the freedom to fly at any route where this kind of flight is intended to operate in visual meteorological conditions and shall avoid clouds and low visibility. These provisions are applicable for manned aircraft nevertheless its application is also relevant to the UAVs where the meteorological conditions are assessed before the take-off to ensure the safe flight of the UAVs. Hence, the weight of UAVs which are typically lighter than manned aircraft which could be flown by air in case of bad weather may expose the trespass issue.

Generally, according to ICAO, airspace that is controllable by the Air Traffic Control Service (ATS) can be divided into seven categories which involve the IFR and the VFR flight; 1) Class A, 2) Class B, 3) Class C, 4) Class D, 5) Class E, 6) Class F and lastly 7) Class G.⁴ Class A is the most restrictive altitude. IFR is allowed to fly in this Class A airspace. The altitude of Class A is approximately 18,000 feet to 60,000 feet. Class B is described as the busiest airport airspace and it permits both IFR as well as the VFR to fly in this airspace. Class C is airspace around the airport and is considered a moderately busy airport with an altitude from 1,500 feet to 4,000 feet from the surface of the land. Class D is for the small airport's airspace around the towered airport with an altitude of 2,500 feet. Moreover, Class E is the less restrictive airspace near the surface of land 1,200 feet or less and does not require radio communication. Class F airspace is uncontrolled airspace and marked as alert or dangerous areas for example military activity areas. Class G is not subject to the ATS clearance. Both IFR and VFR

⁴ Air Traffic Services 2018, (Annex 11 of the Convention on International Civil Aviation), item 2.6. Further reading on appendix 4 of Annex 11.

are permitted to fly in Class G airspace. Countries are varied in determining the limitation of altitude for Class G. However, it may be set from the ground level up to 1200 feet and measured as low-altitude airspace. The rationale to have different categories of airspace is to indicate safety measures in airspace thus the pilots can adjust the aircraft's altitude and speed contingent on the categories of the airspace that they are flying in. In Malaysia, UAVs are prohibited from flying in Class A, B, C, or G airspace, within the aerodrome and flying at a height of more than 400 feet without prior approval from the CAAM.⁵ Thus, the UAV can only be flown below 400 feet from the surface of the ground and not exceed the navigable airspace of manned aircraft.

The further altitude of airspace for UAVs can be divided into two categories; 1) the low-altitude airspace is below 500 feet but the limitation flying only until 400 feet above the surface, and 2) the high-altitude airspace is 500 feet above the surface of the land. Moreover, the National Airspace System (NAS), has set airspace into two categories: 1) regulatory (Class A, B, C, D, and E airspace zones, as well as restricted and banned areas) and 2) non-regulatory (military operations areas ("MOAs"), warning areas, alert areas, and controlled fire areas). Controlled, uncontrolled (e.g., Class G airspace is uncontrolled airspace), special use, and other airspaces, extending to outer space (flight level 60,000 feet ("FL600")) are the four types of airspace included within these two categories.⁶

The industry of commercial and recreation UAVs is expanding due to the demand in the market. However, the legal aspect in terms of the pathway of UAV is still in a vague area and leaves the question of infringing the privacy rights of the

⁵ Civil Aviation Regulations 2016 [P.U.A 97], reg 140(1).

⁶ *Federal Aviation Administration*, "Chapter 15: Airspace", (10 July 2023), <<https://www.faa.gov/regulationspolicies/handbooksmanuals/aviation/phak/chapter-15-airspace>> (accessed on 22 August 2023).

individual. To what extent the free territory is applied to the flying UAV? As flight and aircraft became a reality, absolute ownership of a column of air was viewed as an undesirable barrier in the airspace. Currently, the management of the air traffic is controlled by CAAM and Royal Malaysia Air Force with specific frequencies. The nature of a UAV which is also a flying aircraft without a pilot on board has left clouded space on where this UAV shall fly. The analogy of the existence of cars and other motor vehicles leads to good road infrastructure. The idea of maximizing the use of UAVs for commercial purposes has frozen its execution due to the non-presented and unidentified legal pathway for commercial UAVs to fly in the airspace. The right of airspace for the UAV is still a controversial area between the privacy of the proprietor and the right of manned aircraft in the airspace. The right to airspace has been a long-standing legal controversial and undefined right to the proprietors and the extent of their enjoyment of airspace. Until today, it leaves a blank answer to most countries and it is left to judicial interpretation to define the extent of the land owner's right to airspace.

In *Gelumbang Jaya Sdn Bhd v Jaya Jeans Sdn Bhd*,⁷ the court rejected the defendant's claim on the issue of whether there is intrusion or encroachment, the defendant claims that the defendant's banner, buntings, and flags were always erected above the airspace of the defendant's shop lot No. 95 and had never trespassed on the plaintiff's lot no. 93 or its airspace. The defendant further cited section 44(1) (a) of the National Land Code of 1965, in support of his argument on the defendant's entitlement to the exclusive use and enjoyment of the column of airspace above the surface of the land as equal to the enjoyment of the land below the surface.⁸

⁷ *Gelumbang Jaya Sdn Bhd v Jaya Jeans Sdn Bhd* [2011] MLJU 576.

⁸ *Ibid.*

In the case of *Karuppannan v Balakrishnen, (Chong Lee Chin & Ors, third parties)*,⁹ the Federal Court held that the owner of Lot 26 has no legal authority to encroach on Lot 25's airspace unless Lot 25's owner permits it. The court further observed as follows:

“any person or body to whom land has been alienated, reserved land has been leased or temporary occupation license has been granted in respect of any land ‘shall be entitled to the exclusive use and enjoyment of so much of the column of airspace above the surface of the land, and so much of the land below that surface, as is reasonably necessary to the lawful use and enjoyment of the land’ [s 44(a)]. In clear terms, the law has spelt the right of an individual over his land. He is given the ‘exclusive use and enjoyment’ of the airspace above the surface of his land though not right to heaven above.”¹⁰

The court determined that the adjacent lot owner had seriously trespassed onto land and airspace and that the other party was entitled to an interlocutory injunction to have the trespass removed. By applying the cases to the UAV perspective, the question and controversial issue put forward here is to determine the right over low-altitude airspace. Currently, the altitude of a flying UAV depends on the type of UAV. UAVs that fall under the categories of certified UAVs usually can fly like a manned aircraft at a higher altitude that is more than 500 feet above the surface of the land. This category of UAV usually requires prior approval from the Authority. The open and specific categories on the other hand require the UAV to fly in low-altitude airspace due to its build features. It is a clear-cut law in Malaysia generally, all UAVs are prohibited to fly in the airspace unless the operator or the owner obtains prior approval from the CAAM if the commercial UAV falls under the category of specific or certified. If the certified category involves high-altitude airspace and the specific category involves low-altitude

⁹ *Karuppannan v Balakrishnen (Chong Lee Chin & Ors., third parties)* (1994) 3 MLJ 590.

¹⁰ *Ibid.*

airspace thus the CAAM shall decide appropriately to segregate the navigable airspace for commercial UAVs. Can the proprietor claim his right over the low-altitude airspace? Or, does the low-altitude airspace belong to nobody? These questions will be addressed in detail in the subchapter below.

4.3 SEGREGATION OF THE NAVIGABLE AIRSPACE

The law of airspace began to become a subject in the international arena after World War I with the introduction of international treaties like the Paris Convention of October 13th, 1919 and later the Chicago Convention of 1944.¹¹ The undertaking of “Sky for All” with the aim that all flights including UAVs will be managed and controlled by the Air Traffic Control (ATC) of CAAM by the year 2035 reflects the initiative and readiness of the agency to provide pathways for commercial UAV in the airspace. The airspace above the minimum heights of flight stipulated by-laws, including airspace required for aircraft take-off and landing, is referred to as navigable airspace. It set the minimum altitude for navigable at 500 feet because fixed-wing aircraft generally stay above 500 feet. Since in Malaysia, the Civil Aviation Act defines aircraft as referring to manned as well as unmanned aircraft, therefore generally speaking the law of UAV *vis-à-vis* navigation airspace is within the jurisdiction of CAAM. Unfortunately, the navigable airspace for UAVs in Malaysia is yet to be finalized and will only be ready by the year 2035. In aviation, the lowest safe altitude for aircraft is if the uncongested area is at least 500 feet above the surface of the land. For the congested area of a city and town, or over the assembly of people, the minimum safe flight altitude is 1,000 feet above the highest structure. The definition of navigable airspace is clear in the aviation

¹¹ Widener, M.N., “Local Regulating of Drone Activity in Lower Airspace,” *Boston University Journal of Science and Technology Law*, 22(2), (2016): 242.

industry and thus the CAAM has jurisdiction over navigable airspace. However, this indicator is meant only for manned aircraft. The boundaries of navigable airspace are vertical. The minimum altitude for fixed-wing aircraft flying over populated regions is 1,000 feet over the highest hazard within a horizontal radius of 2,000 feet of the aircraft. The minimal distance in non-congested regions, other than across open water or barely populated areas is 500 feet. The aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure over open water and scarcely populated areas.¹² If the low-altitude airspace can be deemed navigable by UAVs, it will afterwards become a national airspace and unquestionably fall under federal sovereignty. However, the current reality is to respect the use of UAVs in the commercial sphere, which will have an impact on both the federal and state levels as well as one individual.

Segregation further is defined as separation which is the separation of airspace accordingly based on the types of aircraft and altitude line of airspace which includes the UAV. Moreover, Rwanda Civil Aviation Regulations (Part 27 Unmanned Aircraft Systems) 2019, defined segregated airspace as airspace of specified dimensions allocated for exclusive use to specific users.¹³ Thus, UAVs especially commercial UAVs will have a clear pathways altitude where they should fly their UAV. Malaysia does not have this clause on airspace segregation, and the definition of segregation does not appear in any CAAM laws or directives. It is beneficial for Malaysia to adopt Rwanda's practice of defining airspace segregation in order to resolve the legal ambiguity regarding the altitude at which UAVs are permitted to fly into the airspace.

Further, the Rwanda laws are also mentioned in Part 27.060 of Rwanda Civil Aviation Regulations (Part 27 Unmanned Aircraft Systems) 2019, that operators or

¹² McNeal, G.S., "Drones and the Future of Aerial Surveillance", *George Washington Law Review*, 84(2), (2016): 404.

¹³ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), part 27.005.

pilots of UAVs shall obtain prior approval before operating the UAV in the segregated airspace area. Malaysia likewise has this type of requirement, which is represented in the CADs, where prior clearance from various government bodies is required for public safety. The acknowledgement of the consent is given as proof and evidence of the operator's consent to adhere to the laws related to UAV operations.

Before the invention of the UAV became a new trend in the commercial industry the right to use airspace itself was a controversial debate between navigable airspace for aircraft and the rights and enjoyment of proprietors over the airspace above their land. With the introduction of UAVs in this arena, now the discussion of airspace becomes three broad areas as the latter debate is still unsolved. Permitting manned or unmanned aircraft to fly necessitates legislators striking an equilibrium between national (and even international) airspace rights and municipal and state ground rights.¹⁴ In contrast, the exclusivity rights of proprietors over the airspace seem unlimited and undefined. This creates the contentious ownership of airspace, does airspace have no-man ownership due to the inhabitant space? In the principle of navigable airspace in the case of *Causby*¹⁵, the court, in this case, had abandoned the Roman principle of *cujus est solum ejus usque ad coelum*, which is interpreted as "whoever owns the soil, it is theirs up to heaven". 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 scared, leading them to fly into walls and die. The court ruled that airspace above what is regarded as the minimum safe heights is navigable airspace, which Congress has established in the public realm. The court established two fundamental concepts. First, proprietors have exclusive control of the immediate

¹⁴ Ravich, T.M, "Airports, Droneports, and the New Urban Airspace", *Fordham Urban Law Journal*, 44(3), (2017): 596.

¹⁵ *United States v Causby* (1946) 328 U.S. 256.

reaches of the encircling atmosphere. Second, proprietors own at least as much space above the ground as they are permitted to occupy or utilise in connection with the land.

The Court declined to determine the exact altitude of low airspace belonging to the proprietor. The word “immediate reaches of the enveloping atmosphere” is also left for open interpretation and needs a further judicial review as to the exclusivity of ownership of the proprietor over the airspace. This case left a very broad definition of the boundaries and extension of land ownership that include airspace. Bear in mind that this case happened during World War II when aircraft occasionally flew over the airspace of the individual. In addition, UAV technology did not exist at that time, and in light of that, our jurisprudence on ownership of airspace shall be suited to this 21st century.

McNeal¹⁶ recommended several points for the UAV rules on aerial surveillance, one of his recommendations is that proprietors should be able to exclude aircraft, people, and other items from a column of airspace that stretches from their land's surface to 200 feet above ground level.¹⁷ Malaysia has yet to establish the minimum altitude for UAV airspace. The regulation simply specifies the maximum altitude at which UAVs can fly into the area. This recommendation will create a clear line for UAV routes, and thus a definitive line and extent of the UAV's airspace, which may solve the trespass issue.

Further, in the 2006 case *McCarran International Airport v. Sisolak*¹⁸, the Nevada Supreme Court decided whether and to what degree proprietors have a genuine property interest in the airspace above their properties. He filed an inverse criticism action against Clark County, alleging that two county ordinances facilitated a per se

¹⁶ McNeal, 361.

¹⁷ Ibid.

¹⁸ *McCarran Int'l Airport v Sisolak* (2006) 122 Nev. 645, 137 P.3d 1110.

regulation carrying of the airspace above his land, in contravention of the US and Nevada constitutions. The court then conducted its review further into the Nevada Constitution and statutes, concluding that Nevadans had a legal property right in the accessible airspace above their land up to 500 feet. Nonetheless, authorized aircraft may encroach on that right, that is, aircraft may fly below 500 feet over Nevadans' lands as long as they do not encumber the enjoyment of the existing or future use. This is an example of how the definition of ownership of the proprietor's airspace negates the claim of low-altitude airspace for UAVs. Nonetheless, Malaysia continues to uphold section 44(1) of the National Land Code, which states that the appropriate use of airspace for the proprietor varies and is determined on a case-by-case basis, with the word "reasonable" being applied subjectively. The notion of reasonableness applies in all legal systems where it provides the rule of reason and flexibility on the general rule. Furthermore, the concept of reasonableness departs from the traditional judicial examination in which the level of reason is defined by the circumstances and persons. The determination of low-altitude airspace for UAVs is certainly indeterminate, subject to the proprietor's reasonable and effective use of airspace. As a result, trespass and nuisance are the primary concerns for commercial UAVs.

Further, in the case of *Florida v. Riley*¹⁹, the court found that what was growing in the greenhouse could be seen from above. Any member of the public may have legitimately flown a helicopter over Riley's land at a height of 400 feet and witnessed Riley's greenhouse.²⁰ Impliedly the airspace at an altitude of 400 feet belongs to nobody's property and is indeed considered as public property thus UAVs may freely

¹⁹ *Florida v Riley* (1989) 488 U.S. 445, 448.

²⁰ *Ibid.*, 450.

enter this altitude airspace. Since the case of *Guille v Swan*²¹, the law of aviation prohibits any person from operating an aircraft below 1,000 feet above any congested area or below 500 feet above the surface. Since then, the navigable airspace has been set at 500 feet for manned aircraft. Air balloon is prohibited from flying more than 500 feet from the land surface. The altitude of 400 feet above the surface of the ground can be used as an indicator or as a void altitude to differentiate the navigable airspace of manned aircraft, which begins at 500 feet, and the low-altitude airspace proposed for UAVs, which measures maximum at 400 feet above the surface of the land. The navigable airspace for UAVs shall be designated at altitudes ranging from 200 feet to 400 feet above the land's surface.

The commercialization of UAVs in all sectors of the economy has to force the CAAM and other relevant authorities to prepare and take the initiative to provide proper segregation of airspace. The segregation of airspace could be realized either by defining airspace into two zoning; 1) Horizontal zoning of airspace; and 2) Vertical zoning of airspace. These two rules in zoning the airspace offer a balance right and protection of the proprietor against privacy, trespass, and nuisance with the right of UAVs to use the airspace.

4.3.1 Horizontal Zoning of Airspace

The idea of horizontal zoning of airspace has been applied in Malaysian law. It is based on the mapping of the area which is allowable to fly and restricted to fly. Instead of zoning by airspace height and altitude, horizontal zoning approaches the zone according to the location and area of the desired operation. The fact that horizontal zoning offers

²¹ *Guille v Swan* (1822) 19 Johns. 381 (N.Y. Sup. Ct. 1822). In this case, a proprietor sued the operator of the air balloon that had crashed landing in his garden in New York City.

protection to the public against the infringement of privacy, trespass, and nuisance from the flying UAV. With a rigid horizontal limit, the horizontal zoning designated the fixed height and end of the surface owner's possession.²² Furthermore, it will quickly identify the parcel's effective possession zone, and the UAV will then operate and fly at the specified fixed height.²³ The horizontal zoning of airspace needs integration and cooperation from all agencies of government in marking certain places as friendly UAVs or restricted areas for UAVs. The CAAM, JUPEM, and CGSO are responsible for the horizontal zoning of airspace. Horizontal zoning does not provide a good application for UAVs, particularly in commercial settings. This horizontal zoning is only suitable for recreational use where the specific area shall be declared as allowable and legal to fly UAVs.

In Malaysia, as provided under the Civil Aviation Act of 1969, provides several restricted areas to fly UAVs irrespective of the purpose of the UAV which among others are; UAVs must maintain a 50meters distance from people, vehicles, and structures; a 150meters distance from a gathering of more than 1,000 people; and a 30meters distance from people when taking off or landing. Further, CSGO also is responsible for declaring any certain area, especially a government-sensitive area as a restrictive area to fly UAVs. Putrajaya, Airports, and National Events are listed under prohibited areas to fly UAVs. In addition, Part 27.050 (a) (3) of Rwanda Civil Aviation Regulations (Part 27 Unmanned Aircraft Systems) 2019, mentions the operation standard of UAV that every UAV shall not be operated within 30 meters of a person measured horizontally irrespective of the type of UAV operation.²⁴ It is concluded that Malaysia provides

²² Gustafson, L.P., "Arkansas Airspace Ownership and the Challenge of Drones", *University of Arkansas at Little Rock Law Review*, 39(2), (2017): 257.

²³ Ibid.

²⁴ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), part 27.050 (a) (3).

conclusive public safety when compared to Rwanda in terms of keeping UAVs at a safe distance from people.

The rules on the UAV operation must take place during daylight hours, and the UAV must remain within the visual line of sight of the operator is considered horizontal zoning. Mapping the UAV zoning by allowing the commercial UAV to fly either beyond the visual line of sight (BVLOS) or visual line of sight (VLOS) is also constituted horizontal zoning as it limits the movement of the said UAV within the eyesight or the specific radius kilometre. Article 2(7) of EASA Commission Implementing Regulation (EU) 2019/947, defines VLOS as follows:

“visual line of sight operation’ (‘VLOS’) means a type of UAS operation in which, the remote pilot can maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions.”²⁵

According to Article 2(8) of the Regulation, BVLOS is an operating type that is not VLOS. Any UAV that operates remotely and is not visible to the operator or pilot is regarded as BVLOS. Another term for BVLOS is Extended Visual Line of Sight (EVLOS) which carries a similar meaning. In other words, BVLOS offers UAV operations in which the remote pilot does not have to keep the unmanned aircraft within a visual line of sight at all times.²⁶ Furthermore, VLOS is an operation in which the pilot or UA observer maintains direct unaided visual contact with the unmanned aircraft.²⁷ Rwanda has provided comprehensive rules on the BVLOS and VLOS operation procedures for UAVs. The operator shall be able to communicate with ATC during the

²⁵ Commission Implementing Regulation (EU) 2019/947, art 2(7).

²⁶ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), part 27.005.

²⁷ Ibid.

operation involving BVLOS.²⁸ While for VLOS, the operator shall maintain a visual line-of-sight with the UAV or be in direct communications with a UAV observer that maintains a visual line-of-sight with the UAV.²⁹ The unique UAV Regulation of Rwanda also provides certain horizontal restrictions based on weather, where Part 27.115 mentions that any UAV shall not be operated in or into a cloud, at night, and in conditions other than visual meteorological conditions which are based on the ATC clearance.³⁰ For Malaysians, Rwanda's laws can be transplanted into Malaysian law after Malaysia builds the ATC for UAVs, allowing for the successful administration and operation of commercial UAVs based on BVLOS.

In addition, the horizontal zoning of UAVs also can be seen in other countries like the United Arab Emirates (UAE), The UAE General Civil Aviation Authority (GCAA) has set up a mobile application of mapping for no-fly-zone. The app “UAE Drone Fly Zone Map” allows UAV users to find out which regions in the UAE are allocated for UAV operation.³¹ Thus, it encourages the usage of UAVs for private and commercial purposes in UAE with the strict requirements that need to be followed by the operators. The UAE law also further restricts the UAVs to fly near private property, within 5km of the UAE airports’ outer fence, heliports, helicopter landing sites, and airfields, or in controlled zones.³² Malaysia should adopt this approach to prevent commercial UAV operators from intrusion into private airspace and because it serves as a safeguard for both the safety of the general public and manned aircraft.

²⁸ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), part 27.105 (d).

²⁹ Ibid., part 27.100(c) (1).

³⁰ Ibid., part 27.115 (a).

³¹ Konnangath, S., “Drone Laws and Regulations in UAE”, *Court Uncourt*, 6(1), (2019): 34.

³² Ibid., 36.

The restriction to fly in certain classes of airspace also is within the line of horizontal zoning. For example, Part 107.41 of the Small Unmanned Aircraft System Rule of the USA provides:

“No person may operate a small unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from Air Traffic Control (ATC).”³³

Nevertheless, Malaysia prohibits UAVs from flying in Class A, Class B, Class C or Class G without prior consent from the CAAM as per Regulation 140 (1) of Civil Aviation Regulations 2016. These airspace classes categorise the airspace based on the use of the airspace by manned aircraft that is subject to ATC control. Because Malaysia has yet to implement ATC for UAVs, the designation of these classes of airspace is important for limiting the horizontal boundaries of UAV airspace.

Furthermore, Part 107.43 of the Small Unmanned Aircraft System Rule of the USA restricts UAVs from doing an operation in the vicinity of airports. The restrictions imposed by the FAA over the small UAVs in the USA create a balance of regulation between manned aircraft and unmanned aircraft in sharing similar rights of way and use of airspace. The reasoning behind such a limitation is to preserve the public's security and safety, as well as to protect radio frequency and communication from any interference between ATC and manned aircraft. The restriction for UAVs to fly in the vicinity of the airport also exists in Malaysia where the airport and other government premises are listed as a protected area by Malaysian CGSO.³⁴ The declarations and

³³ Operation and Certification of Small Unmanned Aircraft Systems 2016 (Small UAS Rule), part 107.41.

³⁴ Protected Areas and Protected Places Act 1959, (Act No.298).

notifications of such prohibition are made in line with section 4 or section 5 of the Protected Areas and Protected Places Act 1959.

4.3.2 Vertical Zoning of Airspace

In contrast to the horizontal zoning of airspace, another method that which the CAAM segregates the airspace is by way of vertical zoning. Vertical zoning is the segregation of airspace according to the altitude of the airspace. Current law in Malaysia sets the navigable airspace which is controlled by Air Traffic Control (ATC) to be 500 feet. However, the jurisdiction of ATC only covers manned aircraft but does not include UAVs. In the USA, Part 107 of the Small Unmanned Aircraft Rule³⁵ has set the maximum altitude to fly a UAV as 400 feet above the ground level, the remaining 400 feet of a structure. This rule applies to UAVs with a weight of fewer than 25 kilograms. The FAA of the USA also has put the UAV under ATC control whereby the UAV shall get permission from ATC before flying the UAV.

The features of UAVs that are suitable for many sectors do not affect their navigable function as they can fly in whatever and whichever altitudes. Due to that, to protect the privacy of people as well as the navigable airspace for manned aircraft, the law shall be ready to provide vertical segregation accordingly for UAVs. The vertical zoning of airspace establishes layers of airspace according to the altitude with definite lanes for passage according to the different categories of UAV usage.

According to Hazel,³⁶ the zoning of airspace vertically shall be set by the authority to avoid the issue of trespass. The UAV activities below 200 feet have a net impact of lowering societal welfare because UAVs impose substantially far higher

³⁵ Operation and Certification of Small Unmanned Aircraft Systems 2016 (Small UAS Rule), Part 107.

³⁶ Hazel, R.A., "Privacy and Trade Secret Law Applied to Drones: An Economic Analysis", *Columbia Science and Technology Law Review*, 19(2), (2018): 362.

privacy costs while providing minimal additional economic benefits.³⁷ This is the right time to contemplate the actual low altitude of airspace which belongs to the right of a proprietor. Generally, the commercial UAV may fly its UAV within 200 feet to 400 feet above the surface of the land. UAVs indeed neither can fly above the maximum altitude of 400 feet as it may breach the navigable airspace of manned aircraft and will affect the safety of the aircraft nor the UAV can fly below the altitude of 200 feet as it may consider a trespass to land because the proprietor also owns skies above his land.

Amazon's proposal to the FAA suggested that the nation's low-altitude airspace shall be divided vertically.³⁸ Specifically, the FAA shall designate space for UAVs between 400 feet and 500 feet above the surface of land as a no-fly zone for the UAV, this is to ensure the safety of fixed wings manned aircraft in navigable airspace. Then, reserve spaces between 200 and 400 feet for the high-speed transit UAV, and allocate space below 200 feet for, the low-speed transit UAV.³⁹ However, Amazon did not state specifically the types of UAVs or the weight of UAVs that shall fall under the category of low-speed transit and high-speed transit.

The CAAM may use this blueprint on vertical zoning in classifying the right to use the airspace. Thus, in the category of high-speed transit, the operator shall get prior approval for the permit to fly a UAV from CAAM. On the other hand, the low-speed transit, because the altitude is set at 200 feet, the operator shall get prior approval from CAAM, an avigation easement from the affected proprietor if the UAV passes private lands; and a permit to use airspace from the Land Registry if the UAV passes the skies of State land or reserved land. Part 27.050 of Rwanda Civil Aviation Regulations (Part

³⁷ Hazel, 362.

³⁸ Weise, E., "Amazon Proposes Dividing Air into Drone Zones", *USA Today*, 29 July 2015, <<http://www.usatoday.com/story/tech/2015/07/28/amazon-drone-zone/30798777/>> (accessed on 14 June 2021).

³⁹ Ibid.

27 Unmanned Aircraft Systems) 2019, specifically provides the standard operation of UAV, where it sets the altitude at or below 120 meters (400 feet) above ground level (AGL) by day. Figure 3.1 shows a suggestion for lining up vertically the low-altitude airspace for the commercial use of UAVs in Malaysia.

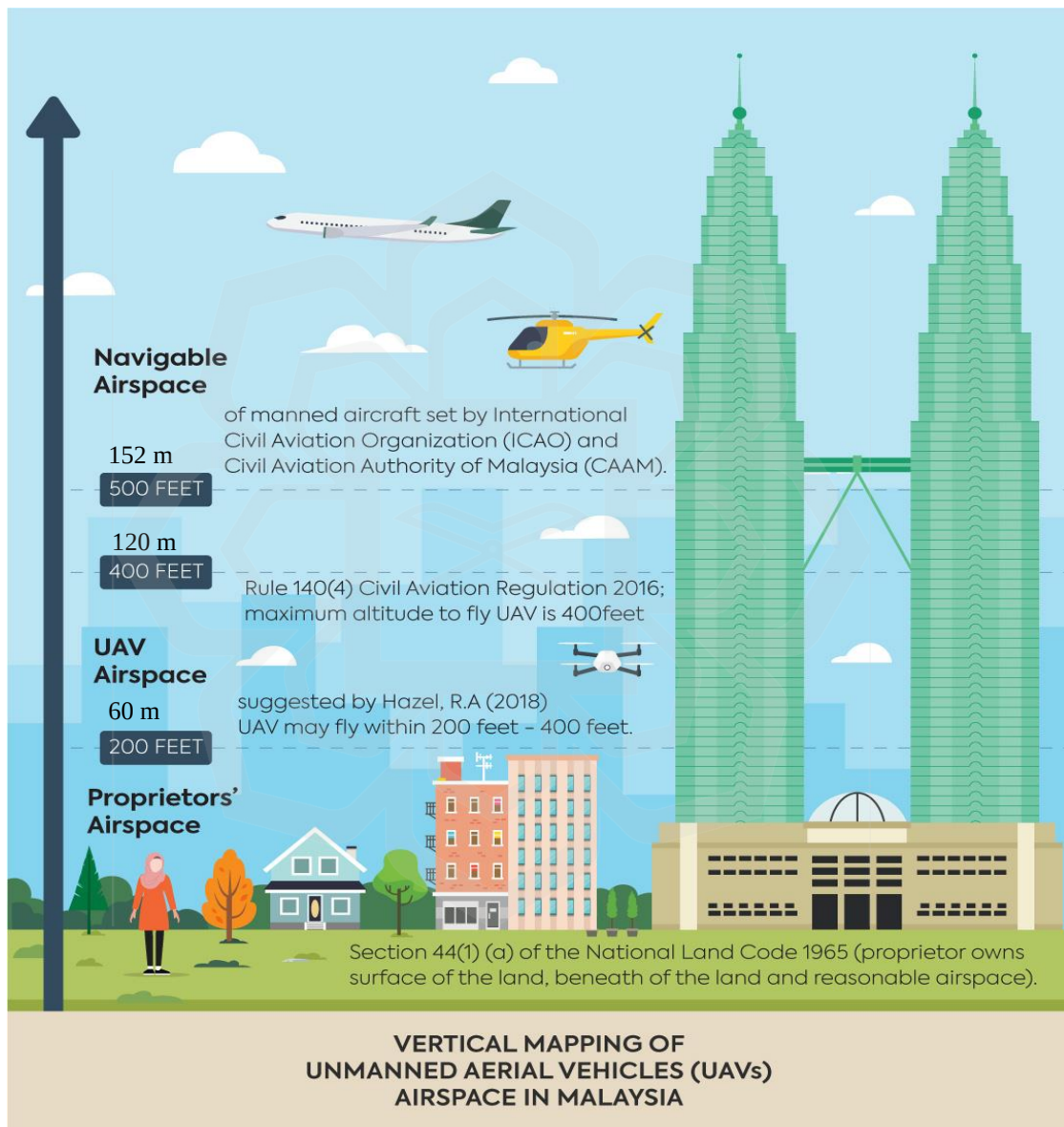


Figure 4.1: Vertical Mapping of Unmanned Aerial Vehicles (UAVs) Airspace in Malaysia.⁴⁰

⁴⁰ Norhusna Emirah Onn *et al.*, “The Legal Perspectives of the Doctrine of Navigability of Airspace for Commercial Unmanned Aerial Vehicles (UAVs) in Shipping and Delivery”, *International Journal of Law, Government and Communication*, 7 (29), (2022): 683.

Most of these concerns are related to the dangers of UAVs colliding with conventional aircraft. Nevertheless, a rising number of concerns arise as a result of conflicts between civilian UAVs and activity on the ground.⁴¹ Most commercial drone flights are short distances and may not necessarily qualify as fundamentally interstate.⁴² Civilian UAVs must fly below a specific altitude that is below 500 feet and away from airports and helicopters to meet the specified goals of strengthening manned aircraft safety and reliability. In the future, the UAV manufacturing standard shall include a safety system of collision avoidance or "sense and avoid" systems, to allow the devices to detect and automatically modify the path to avoid other physical things.⁴³ Return-to-home or lost-link emergency functions must be included in the pre-programmed UAV so that if the UAV loses its wireless connection with its operator, it will immediately return to the operator.

Another justification for a more municipal role in UAV regulation is that UAVs need a location-sensitive regulatory strategy, which only local governments are capable of establishing and enforcing successfully the zoning laws nearly a millennium earlier in the USA.⁴⁴ Municipal involvement in defining UAV zoning rules is vital to preserving the serenity of residential neighbourhoods and offering assurance to the public regarding privacy issues. To quote Justice Sutherland's judgement in the landmark zoning case, *Village of Euclid v. Ambler Realty Co*,⁴⁵ as follows:

“Building zone laws are of modern origin Until recent years, urban life was comparatively simple; but with the great increase and concentration of population, problems have developed, and constantly are developing, which require, and will continue to require, additional

⁴¹ Rule, T. A., “Drone Zoning”, *North Carolina Law Review*, 95(1), (2016): 140.

⁴² *Ibid.*, 155.

⁴³ *Ibid.*, 164.

⁴⁴ *Ibid.*, 179.

⁴⁵ *Village of Euclid v Ambler Realty Co* (1926) 272 U.S. 365.

restrictions in respect of the use and occupation of private lands in urban communities. Regulations, the wisdom, necessity, and validity of which... are so apparent that they are now uniformly sustained, a century ago, or even half a century ago, probably would have been rejected as arbitrary and oppressive. Such regulations are sustained, under the complex conditions of our day, for reasons analogous to those which justify traffic regulations, which, before the advent of automobiles and rapid transit street railways, would have been condemned as fatally arbitrary and unreasonable. And in this, there is no inconsistency, for while the meaning of constitutional guarantees never varies, the scope of their application must expand or contract to meet the new and different conditions.”⁴⁶

Throughout the USA, municipal zoning was used by legislators in the early twentieth century to properly manage the expanding number of land-use conflicts that arose at the time, and UAV zoning could serve a similar purpose as UAVs struggle for low-altitude airspace in the upcoming decades. Several communities in the USA have already enacted legislation to preserve the tranquillity of residential areas from advanced UAV technologies. In essence, commercial use of UAVs should be legalised only when and where its net community benefits exceed zero, which would differ from one location to the next.⁴⁷ Alternatively, if a proper rule to regulate UAV zoning cannot be found at the federal or state level, communities may declare the region a free zone UAV neighbourhood or otherwise. The concern of the commercial use of UAVs should be integrated as well by the municipal council and be part of the enforcement bodies besides the Royal Malaysia Police in securing public interest. Zoning the UAV airspace by the district is manageable as it involves a small part of an area, which can be done by the municipal and district councils.

⁴⁶ *Village of Euclid v Ambler Realty Co* (1926) 272 U.S. 365.

⁴⁷ Rule, 186.

4.4 AVIGATION EASEMENT FOR UAV AND PERMIT TO USE AIRSPACE

If the line of airspace or the declaration of low-altitude airspace as navigable airspace is way far to realise, there are several alternative methods available in the property and land law. According to property law, proprietors have long been recognised as having interests in more than just the surface of a lot, they also have interests in at least some of the airspace immediately above the surface.⁴⁸ There is a guideline on the extent to which proprietors have the right to keep unwelcome objects like UAVs out of the low-altitude airspace directly above their property. Gustafson⁴⁹ argued that the legislator had begun to abandon the *ad coelum* principle vis-à-vis ownership of airspace and further adopted and used these two theories; the public easement theory and the privilege of flight tort theory; the airspace was still owned by the surface owners, but the former recognised a public easement for aviation traffic, while the latter provided aviation traffic with a privilege that served as a trespass defence.⁵⁰ The theories show the surface owners' power to ban aircraft from navigable space above their lands, although proprietors continued to own all of the airspaces.

An easement is a right that the registered proprietor of a particular land has, even so, for the good use of that land, to be doing and continue to do something, or even to restrict and continue to restrict anything from being done, on or upon or in respect of other lands that is not his own. Avigation refers to aerial navigation which entails the guidance and direction of aircraft in the air. If a commercial UAV happens to fly at an altitude below 200 feet above the surface of the land, the grant of a right of way or avigation easement from the proprietor is necessary. For example, the Prime Air of

⁴⁸ Rule, 170.

⁴⁹ Gustafson, 257.

⁵⁰ Ibid.

Google is willing to pay the proprietor for the avigation easement of its UAV. The payment of avigation easement is considered a consideration and undertaking of the proprietor to allow reasonable interference from the enjoyment of his land.⁵¹ Section 42(1) (e) of the National Land Code 1965 provides that the State Authority shall have the power to issue and grant a permit to use airspace on or above State land or reserved land in accordance with the provisions of Chapter 4 of Part Four provided that such airspace shall be within the confines of a structure of any description erected therein on the State land or reserved land. Chapter 4 of the NLC provides several provisions that permit to use of airspace above the state land or reserved land. Nevertheless, this chapter does not apply to the private proprietor.

Furthermore, sections 75A to 75G mention that this permit may be granted for a maximum of 21 years over the state land or the reserved land in certain circumstances. Bear in mind that this regulation applies to State land or reserved land and does not apply to private property. Does this permit to use airspace apply to the flying UAVs? If so, does it contravene the regulation by CAAM? Thus, UAV may request a permit to use airspace for up to 21 years if the flying of the UAV is located above the State land or reserved land.

The initial approach in avigation easement was seen in providing the right of way for the airport; which is generally at a low altitude at the same time as to protect the proprietor from the persistent trespass and nuisance from the vibration and noises of aircraft. This kind of exchange is legal according to land law thus necessary fees shall be paid to the proprietor. The word avigation is a combination of the words aviation and navigation. Generally, avigation easements are obtained to secure airspace for

⁵¹ Watson, T., “Maximizing the Value of America’s Newest Resource, Low-Altitude Airspace: An Economic Analysis of Aerial Trespass and Drones”, *Indiana Law Journal*, 95(4), (2020): 1425.

airport and runway approach protection and noise compatibility programs.⁵² Commercial UAV operators should pay the proprietor annually for aviation permits. This permit shall be treated as an exchange of waiver of the proprietor over the claim of trespass and nuisance by the commercial UAV. On the other hand, commercial UAV operators shall have private routes to fly their UAVs. The aviation permit shall specify the navigation altitude for UAVs to fly. It could be 200 feet to 400 feet from the surface of the land. Some of the top layers' permitting in commercial zoning districts may be costlier, because navigating through them may result in a loss of an alternative economic chance to expand or lease for sustainable growth of speciality nature, such as windmills, cellular towers, billboards, or the fee owner's potential transfer of development rights.⁵³ The aviation easement is suitable for commercial UAVs that fly in low-altitude airspace.

In Malaysia, the aviation easement is considered new when involves private property or land. The transaction for approving the route based on the aviation easement is a two-party agreement between the UAV's operator or owner and the proprietor. The charge for the easement may be paid directly to the owner in exchange for the UAVs' use of low-altitude airspace. Alternatively, if the government has designated UAV airspace as part of its national economic plan, the route for UAV airspace might be well-designed, which would entail acquiring and compensating the affected proprietors. However, several State land regulations have provided the provision on the permit application to use airspace with regards to the State land and reserved land and these regulations do not apply to private land. The term of application for the use of airspace above the State land and any reserved land is a permit and will

⁵² Widener, 243.

⁵³ Ibid., 259.

be granted annually to the applicant. If the usage of airspace involves private property thus the correct term is the avigation easement. For example, In Malaysia, although several rules have provided the permit to use airspace, especially in low altitudes specifically in the State land and the reserved land. In exercising powers conferred by sections 14 (power of the State Authority to make rules), section 435 (rules on rice cultivation), and section 445 (powers of State Authority to make additional transition provisions) of the National Land Code, all State Authorities in Malaysia have introduced their own land rules which covered selected land matter, especially regarding the fees, rent and permit for the State lands and reserved lands.

The fees and expenses associated with obtaining a permit to use airspace under section 75D of the National Land Code are outlined in rule 25 of the Selangor Land Rules of 2003. This rule outlines seven objects with varying fees that are further separated into three categories: public purpose, private purpose, and commercial purpose. The provision of item 7 "other usage" may apply to UAVs. The commercial UAV is required to pay RM40 per year for a permit to use airspace above the state land in Selangor.⁵⁴ Next, the applicant shall submit and attach the sketch plan for the use of airspace.⁵⁵ The applicant shall state the reasons and considerations for the assignment of the permit to use airspace above state land or reserved land.⁵⁶

Rule 19(d) of the Perak Land Rules of 1966, for instance, states that the State may grant a permit to use the airspace under certain circumstances and that the applicant for the said permit will be charged fees. The State Authority will determine the fees for

⁵⁴ Norhusna Emirah Onn, "The Principle of Ad Coelum in Respect to the Low-Altitude Airspace for the Commercial Unmanned Aerial Vehicles (UAVs) in Malaysia", *International Journal of Law, Government and Communication*, 7 (30), (2022): 117.

⁵⁵ Selangor Land Rules 2003, para 51(r) sch XVIII.

⁵⁶ Ibid., para 51(s) sch XVIII.

UAVs deployed for commercial purposes, which may fall under the description of "other purpose" as stated in item 4 of the aforementioned rule.⁵⁷

Moreover, in Johor, the application for a permit to use airspace above the state land and reserved land can be made through the form prescribed in Schedule 18 together with the layout of the intended use of airspace as mentioned in Rule 38B(1) of Johore Land Rules 1966 (JPU 39/1966).⁵⁸ Meanwhile, the application for the assignment to use airspace shall be made through the form in Schedule 19.⁵⁹ This rule must be read in accordance with section 75E of the National Land Code of 1965. The commercial use of UAVs may come within the ambit of the word 'others' as mentioned in Rule 38C (1). In addition, item 36 of Table V prescribes the administration fees for the application to use airspace above State land or reserved land is RM100 per title.⁶⁰ The calculation is as follows:

“Total of square meters x periods of lease x 1/32% of the quit rent = fee to be paid.”⁶¹

In Perlis, Rule 26(1) of Perlis Land Rules 1987,⁶² mentions the State Authority may grant permission to use any airspace above the State lands or reserved lands to any person or body corporate. This is a bright future for commercial UAVs to apply for a permit for the right of way based on this rule. Rule 26(2) of Perlis Land Rules 1987 further provides six items (a) until (f) that are listed with prescribed fees within three categories; public, private, and commercial. Rule 26(3) mentions the State Authority

⁵⁷ Norhusna, 117.

⁵⁸ Johore Land Rules 1966 (J PU 39/1966), r 38B (1).

⁵⁹ Ibid., r 38B (2).

⁶⁰ Norhusna, 118.

⁶¹ Ibid.

⁶² Perlis Land Rules 1987, r 26 (1).

shall determine the annual fee for a permit to use airspace for a purpose other than those specified under paragraph (2) of this Rule. The commercial use of UAV may come under the definition of Rule 26(3) of Perlis Land Rules 1987 where the operation of UAV is outside the scope of item (a) until (f) of Rule 26(2). Thus, this rule may be applied to the UAV operators if the operation is above the state land or reserved land. Further, there will be a prescribed fee imposed for the application to obtain the permit to use airspace as specified under section 75B of the National Land Code.⁶³

In addition, Rule 4A (1) of the Trengganu Land Rules 1966⁶⁴ provides that the application for a permit to use airspace as per section 75A of the National Land Code 1965 shall be made in writing by using Form E set out in Schedule 9, the application shall be addressed to the Land Administrator of the district in which the land is situated, the applicant shall then submit and attach the layout of the intended use of airspace. This application for a permit to use airspace is not certain where according to Rule 4A(4) of Trengganu Land Rules 1966, the District Land Administrator may reject any application which is not in the prescribed form or which in his opinion does not disclose sufficient particulars of the applicant or the land. Furthermore, except for an application that has been rejected under rule 4A (4) the District Land Administrator shall record particulars of the approved permit in a “Record of Permits to use Air Space” in Form F set out in Schedule 10.⁶⁵ The same goes for any approved application of assignment of permit to use of airspace shall be recorded in a “Record of Permits to use Air Space”.⁶⁶ The assignment of permit to use airspace under section 75E of the Code shall be in Form G set out in Schedule 11 where the applicant shall state the reasons for the assignment

⁶³ Norhusna, 117.

⁶⁴ Trengganu Land Rules 1966 (Tr PU 11/1966), r 4A (1).

⁶⁵ Norhusna, 118.

⁶⁶ Trengganu Land Rules 1966 (Tr PU 11/1966), r 4A (7).

to use airspace.⁶⁷ According to rule 18A, there are three types of permits to use airspace, each with a different fee: (a) for residential purposes, RM4.00 per square metre subject to a minimum of RM40.00 per 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 not otherwise specified, the fees may be determined by the State Authority. Rule 18A clause (c) may be used to apply for a permit to use airspace for the commercial use of UAVs.

In Pahang, Pahang Land Rules 1992 which came into force on the 1st day of January 1994, has provided several provisions on the permit to use airspace above the state land and reserve land which can be applied for the right of way for commercial UAVs. The application for a permit to use airspace above State land must be made using Form 6 and addressed to the Administrator of the district where the land is located.⁶⁸ The application of permit is not conclusive as the Administrator may reject the said application which is not in the prescribed form or which in his opinion does not disclose sufficient particulars of the applicant or the land.⁶⁹ Rule 36 further explains 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; within three categories of; public purpose, private purpose and commercial purpose. Regrettably, Pahang Land Rules 1992 did not include the terms “other purpose or usage” in its provision. Therefore, the commercial use of UAVs cannot be interpreted according to the Pahang Land Rule due to the inflexibility of provisions.⁷⁰

⁶⁷ Trengganu Land Rules 1966 (Tr PU 11/1966), r 4A (6).

⁶⁸ Pahang Land Rules 1992 (Phg PU 27/2015), r 35(1).

⁶⁹ Ibid., r 35(3).

⁷⁰ Norhusna, 118.

In exercise of the powers conferred by sections 14 and 445 of the National Land Code, the State Authority of the State of Kedah, Rule 37(1) item 81 of Kedah Land Rules 1966 (K PU 6/1966) provides the prescribed fees for the application for consent of any assignment of right over airspace, where the applicant shall pay RM200 per application.⁷¹ Moreover, Rule 20(1) item 50, of Malacca Land Rules 1966 mentions the prescribed fee for applying for a permit to use airspace is RM100 per application.⁷² Kedah Land Rules and the Malacca Land Rules did not expand on the types of assignments and the purpose of use of airspace, as do other State Land Rules, creating room for interpretation.

Due to the minimum altitude of 500 feet being set as navigable airspace and controlled by the ATC, the approach to provide pathways for commercial UAVs in the future will affect the growth of Malaysia's economy. A commercial UAV is unlike a commercial manned aircraft whereby it only flies in the low altitude airspace and does even not reach 500 feet of navigable airspace. Thus, the CAAM shall take the initiative in providing the right of way for UAVs and it shall be controlled by ATC by 2035 showing the readiness of Malaysia to uphold the Chicago Convention in the aviation industry. The mission of the year 2035 is quite far from what the Rwanda Civil Aviation Authority (RCAA) has done in their UAV law as they had integrated the navigable airspace for the UAV under the supervision of the ATC unit.⁷³

Instead, the UAV operator applies for the permit of aviation easement from the proprietor himself, the CAAM may properly design and identify the UAV routes and determine whose land would be affected by the UAV routes. CAAM may become the sole administrator in the application of a permit and will directly contact the proprietor

⁷¹ Kedah Land Rules 1966 (K PU 6/1966), r 37(1) item 81.

⁷² Malacca Land Rules 1966, r 20(1) item 50.

⁷³ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), part 27.065.

concerning the pathways of the UAV. The operator or the owner of the UAV may pay a specific amount for the application of the said permit. The proprietor will be paid annually by the CAAM for the avigation easement because the application for the commercial use of UAVs may vary year by year. There is also no precedent as yet in Malaysia to the sale and purchase of airspace if they opt to pay in lump-sum payments. Because the exclusive enjoyment of the proprietor over the airspace is attached to the surface of the land and the land beneath it.

4.4.1 Application Easement for Commercial UAVs

The other infrastructure of commercial UAVs is not just the right of way, but it can be extended to include the establishment of a UAV hub akin to an airport with ATC. Widener, M. N suggested in his article on the planning of the “Drone corridors” which barely will be ideal.⁷⁴ In the future, the Drone Corridors also be highlighted as a new infrastructure that will benefit most of the commercial use of UAVs. As of today, the current infrastructure consists of pathways for motor vehicles, trains, bicycles, and pedestrians. In the future, Drone corridors also shall be integrated into the development of infrastructures in towns and cities as per the development of UAVs in the commercial arena, especially in delivery services.

In Malaysia, Johor is the first country and the first in South East Asia that provide friendly drone zoning and robotic area. DRZ Iskandar which is located in Iskandar Puteri, Johor, is a public-private partnership by the Johor State Government to introduce an eco-friendly robotic project which aims to create UAV-friendly areas in their development infrastructures. The UAVs are free to fly in this area for research and

⁷⁴ Widener, 254.

innovation purposes. This project is also acknowledged by CAAM to encourage further development of innovation in UAV projects. DRZ Iskandar is considered one hub for all UAV inventors in developing and testing their innovations in commercial UAVs at the specifically designated area of the Drone Test Zone (DTZ). DHL Express Malaysia, FELDA, and several other firms are now working together on this initiative to achieve social impact and commercial value through the use of UAVs.

The requirement of aviation easements may be extended to the drone port. Instead of the airport which is meant for manned aircraft, the Drone-port is relevant for aviation easements, especially during take-off and landing as to provide sufficient protection measures for commercial UAVs to operate according to the safety procedures with regard to the public that may be affected by the UAV. Unlike the private use of UAVs where it does not need a runway to take off because can be launched from individual properties,⁷⁵ the commercial use of UAVs is much more relevant to have a drone port due to the increasing capacity of commercial transactions in the future. Rwanda, for example, could be the first country in the world to have a network of UAV airports, as its civil aviation authority is reportedly drafting regulations in anticipation of investor interest in developing a logistics system in Africa to transport medicine to remote locations which difficult to reach by road.⁷⁶ These Drone-ports are seen as potential and exclusive infrastructures of commercial UAVs must have because they will support cargo drone systems able to deliver essential supplies in huge volumes to remote places.⁷⁷ UAVs will land on the containers' roofs and, using a docking mechanism, lower their cargo into the container's interior via a chute. It is also

⁷⁵ Gustafson, 262.

⁷⁶ Staff Author, "Rwanda to Host World's First 'Drone Airport'", *CIO East Africa*, 13 October 2015, <<https://cioafrica.co/rwanda-to-host-worlds-first-drone-airport/>> (accessed on 24 August 2023).

⁷⁷ Ravich, 614.

considered an e-commerce hub for commercial UAVs in terms of maintenance of the UAV, charging ports, leasing runway spaces, and UAV traffic control. The drop zones for UAVs are another mechanism in drone ports whereby it provides sufficient infrastructure for commercial UAVs a place or zone to drop articles or parcels for the intended customer. The drop zone will be aided by a unique QR code⁷⁸ and shall follow the identical route as per customer request. The transmission by QR code is generated by the customer's smartphones for a secure and complete delivery process to the customer's doorstep.

4.5 LEASING THE AIRSPACE FOR COMMERCIAL UAV

One major problem for the CAAM in dealing with the UAV is to integrate the UAV infrastructure or right of ways exclusive to the UAV with the manned aircraft. Since the pandemic of Covid-19, major companies have started to initiate commercial UAVs in many sectors of the economy. Commercial and economic activity is accelerating, but laws are not. However, existing legislation in the National Land Code may aid in the proliferation of commercial UAVs by leasing airspace.

Leasing according to the National Land Code of Malaysia is described as the power of the registered proprietor to lease the whole or any part of the land for a term exceeding three years.⁷⁹ The leasing period can be extended from thirty years to ninety-nine years as provided in section 221(3) of the National Land Code. The calculation of the term of the lease could be weekly, monthly, annually, or term of a fixed period depending on the wishes of the parties to the lease agreement.⁸⁰ The application of any

⁷⁸ Ravich, 258.

⁷⁹ National Land Code 1965 (Act 56), s 221.

⁸⁰ Ibid., s 224(a) and (b).

part of the land in the provision of section 221 may include the ownership of airspace above the registered land.

Leasing the airspace here is to develop a route, especially for the commercial UAV to use the airspace and fly legally uninterrupted from any claim of trespass and nuisance. Thompson⁸¹ suggested that leasing the airspace could be managed in the airspace above the highway. Commercial UAV operators and owners should contact the relevant state government to discuss leasing highway airspace.⁸² For example, KLIA Expressway is within the jurisdiction of the Federal Road, and the operator of a commercial UAV may negotiate with the company or federal government to lease the airspace for the right of way. This kind of transaction can easily be achieved as it involves a private individual. The concept of a lease is to ensure the commercial UAV is secure enough to use the airspace for commercial purposes for a longer period which can be more than one year to three years as per the agreement between the parties involved. The difference between a lease and an easement of airspace is in terms of the length or period of the permit itself for the right to use airspace for commercial purposes.

Despite the rule that airspace belongs to nobody, the term lease here indicates that airspace is somehow owned by an individual. Thus, the proprietors or the proprietors may lease their airspace for the UAV infrastructures. The area above and below the highway's defined grade line is known as highway airspace.⁸³ Additionally, airspace must be contained within the permitted right-of-way border. As soon as the location of the highway is determined, the design for the particular airspace highway will be on the vertical zone above that particular location with an altitude of around 200

⁸¹ Thompson, D., "Rethinking the Highway: Integrating Delivery Drones into Airspace Above Highways", *Indiana Law Journal Supplement*, 95, (2019-2020): 8-27.

⁸² Ibid.

⁸³ Ibid., 17.

feet to 400 feet. Still, this UAV airspace highway will not interrupt the navigable airspace of the manned aircraft as the route vertically ends at 400 feet above the land surface. The design of the existing route of the highway is the blueprinted route for the UAV's airspace highway. Currently, the National Aeronautics and Space Administration (NASA) is developing research called Universal Traffic Management (UTM) for UAVs.⁸⁴ This research is to facilitate the UAV to safely access the low-altitude airspace beyond the visual line of sight (VLOS). Therefore, the commercial UAV may integrate the UTM to control air traffic management and communication with other UAVs. This UTM is different from the ATC which is controlled by CAAM for commercial aircraft because UTM will be based on the digital sharing of users' planned flight details and a new way to handle the airspace.⁸⁵ UTM will facilitate the airspace design, airspace traffic, geo-fencing, and also avoidance of weather.⁸⁶ This kind of invention will help the economic growth of the nation as it offers efficient and less expensive services.

Determining who may lease the UAV airspace depends on the ownership of the said land or surface. Every route and highway in Malaysia is under the jurisdiction of either a Federal road or state road, or it may fall under the municipal local authorities. The mapping of the Federal roads and State roads can easily be obtained from the portal of the Malaysian Public Works Department (JKR).⁸⁷ In Malaysia, there are almost thirty expressways or highways that are connected to interstates. Further, there are almost 100 highways classified under Federal roads, almost 12 highways are classified as State

⁸⁴ Thompson, 12.

⁸⁵ Blake, T., "What is Unmanned Aircraft System Traffic Management", NASA, (28 May 2021) <<https://www.nasa.gov/ames/utm/>> (accessed on 12 June 2021).

⁸⁶ NASA, "Unmanned Aircraft System (UAS) Traffic Management (UTM)", <<https://utm.arc.nasa.gov/index.shtml> [https://perma.cc/L3VP-35K3]> (accessed on 12 June 2021).

⁸⁷ Kementerian Kerja Raya, "List of Federal Roads and Map" <<https://www.kkr.gov.my/en/list-of-federal-roads-and-map>> (accessed on 24 August 2023).

roads, and around 26 highways are under municipal jurisdiction. Therefore, the possibility of UAV highways emerging and expanding is optimistic if Malaysia is ready to adopt this approach by leasing the airspace to commercial UAVs. Besides that, by leasing the airspace to the commercial UAV, the federal government, the state government, as well as municipal and local authorities, can generate a long-term gross national income for state and national development. Both parties to the contract will benefit from this leasing airspace agreement. Outsourcing airspace rights to UAVs to facilitate new infrastructure achieves this objective without the need to construct new roads or reconfigure existing ones. New modes of transportation will necessitate investment as air travel reduces the costs of building physical roadways as well as the consequent urban sprawl.⁸⁸ Georgia, for example, allows its transportation department to license air rights above limited-access highways for development as commercial operations or activities.⁸⁹

Instead of banning the use of UAVs in the airspace, just use this analogy to differentiate the airspace highway from the ordinary motor-vehicle highway; back in the day when the car was invented, people accepted it very well despite they drive recklessly as the car was seen more beneficial as compared to horses. Instead of banning a car, they developed infrastructure from year to year until today we have comprehensive traffic regulations and highways.⁹⁰ Then apply to the commercial use of UAVs, how far this idea and invention have circulated the market but the infrastructure for UAVs vegetated by the bureaucracy rules will kill the invention itself.

⁸⁸ Thompson, 22.

⁸⁹ Georgia Code Ann (West 2018), s 32-6-117.

⁹⁰ Atherton, K.D., "The Future of Urban Planning: Zoning for Drones", *Popular Science*, (22 Aug. 2014), <<https://www.popsoci.com/article/technology/future-urban-planning-zoning-drones/>> (accessed 22 June 2021).

4.6 AIRSPACE COMPULSORY ACQUISITION

By virtue of various international conventions and treaties, Article 17 of the United Nations Universal Declaration of Human Rights, Article 14 of the African Charter on Human and Peoples' Rights (1981) and Protocol No. 1 of the European Convention for the Protection of Human Rights and Fundamental Freedoms 1950 provide the right of peaceful enjoyment of land as a fundamental liberty of each and individual which uphold the sense of belonging and ownership over the real property. In the case of *Minister for Army v Dalziel*,⁹¹ a property is a collection of rights that can be exercised over it. Therefore, in principle, each ownership claim over an item is a property in and of itself.⁹² Nevertheless, the ownership of land and real property is not absolute and is sometimes subject to the law of the nation. In Malaysia, the right to own property is a constitutional guaranteed in article 13(1) of the Federal Constitution save in accordance with the law.

In addition, section 44 (1)(a) until (c) of the National Land Code mentions the extent of disposal and ownership of the proprietor over the land is subject to the law as follows:

“Subject to the provisions of this Act and of any other written law for the time being in force, any person or body to whom (under this Act or a previous land law) land has been alienated, reserved land has been leased or a temporary occupation licence (including a licence so styled under a previous land law) has been granted in respect of any land, shall be entitled to—

- (a) the exclusive use and enjoyment of so much of the column of airspace above the surface of the land, and so much of the land below that surface, as is reasonably necessary to the lawful use and enjoyment of the land;
- (b) the right to the support of the land in its natural state by any adjacent land, and all other natural rights subsisting in respect thereof; and

⁹¹ *Minister for Army v Dalziel* [1994] 68 CLR 269.

⁹² *Ibid.*

(c) where the land abuts on the foreshore or any river or public place, but subject to any express provision in the document of title, lease or licence, a right of access thereto.”⁹³

The law provided in section 44 of the National Land Code indirectly highlights the ownership of proprietors over the land is not absolute. The law in the National Land Code and any other laws may disturb the enjoyment of the land. In the context of the UAVs, since there is no exclusive right of way for the UAVs to fly in low-altitude airspace which most probably belongs to the proprietor of the land thus another alternative method that the government can embark on using the method of compulsory acquire the land, particularly the low-altitude airspace. By compulsory acquiring the airspace the government and CAAM can declare the low-altitude airspace as the navigable airspace for the UAVs rendering it to become a public airspace. Consequently, the issue of trespass will not happen when the airspace itself is subject to the control of ATC.

However, it is well established in many jurisdictions that the state needs land to suit national and public interests. A country would struggle to build infrastructure if it did not acquire land.⁹⁴ Building the right of way for commercial UAVs which is an important infrastructure to boost the national economy can be considered as a crucial national building for the interest of the public as well. Although the protection of public interest is important in Malaysia, the private interest also must be the key element in assessing and balancing both interests with the ultimate aim to honour it as one of the human rights. Land acquisition is always about striking a balance between the state's power to acquire property rights and citizens' private property interests.⁹⁵ Some

⁹³ National Land Code 1965 (Act 56), s 44.

⁹⁴ Noor Asyikeen Mohd Salleh., & Peng, S., “Striking Balance between Public and Private Interests in Land Acquisition: Cross-Jurisdictional Perspective”, *IIUM Law Journal*, 30(1), (2022): 137.

⁹⁵ *Ibid.*, 142.

countries prioritise public interests, while others prioritise private property rights, and yet others achieve a balance between the two.

Although the right to own property is guaranteed and considered a constitutional right and protected under article 13 of the Federal Constitution, nevertheless, the proviso under subclause 2 of article 13 of the Federal Constitution allows action taken by the State to compulsorily acquire land, where the section says:

“No law shall provide for the compulsory acquisition or use of property without adequate compensation.”⁹⁶

In general terms, land acquisition is the power given to the state to compulsorily acquire any private land for public use with adequate compensation. The compensation here served as a consideration for the loss of ownership due to the acquisition. Clause 2 of Article 13 provides a measurement of the balancing idea between protecting both the public interest and the individual interest by awarding compensation for such affected acquisition. In the case of *Perbadanan Pengurusan Ara Ampang v Pentadbir Tanah Daerah Hulu Langat*, the court emphasised that receiving reasonable compensation for the compulsory acquisition of properties is a constitutional right.⁹⁷ Furthermore, in the case of *Beh Chew Tai & Ors v DC & A Developments Sdn Bhd*,⁹⁸ the High Court highlighted that:

“A compulsory acquisition is a process and authority vested only upon the state and land authorities to be exercised (and executed). As simpliciter, the compulsory acquisition would inter alia involve the planning and approval of the acquisition, the declaration and gazetting of the acquisition, the offer of compensation for acquisition, the acceptance

⁹⁶ Federal Constitution (Malaysia), art 13(2).

⁹⁷ *Perbadanan Pengurusan Ara Ampang v Pentadbir Tanah Daerah Hulu Langat* [2021] 10 MLJ 752.

⁹⁸ *Beh Chew Tai & Ors v DC & A Developments Sdn Bhd* [2023] MLJU 620.

or rejection of the same offer by the land owner, payment of the compensation amount (if there were no protests), and finally the taking of possession of the acquired land by the authorities after the issuance of Borang K.”⁹⁹

This intrinsic power of the state is used all over the world and is recognised by different names depending on the country's legal terminologies, such as 'eminent domain or takings' in the United States and 'compulsory acquisition' in Australia and Malaysia.¹⁰⁰ Malaysia has specific legislation which is the Land Acquisition Act 1960 with an objective to cover the issue of compulsory acquisition of land and assessment of compensation which was gazetted and enforced on 13th October 1960. Although the Act defines land as alienated land, land occupied under customary right and land occupied in expectation of title it covers extensive definition by adding the word ‘within the meaning of the State land law’¹⁰¹ which covers the definition of ownership of land to surface of the land, beneath of the land and the reasonable airspace as well. This definition can highlight the possibility of compulsory acquisition of reasonable airspace of the proprietor for commercial use of UAVs as well. The general term of the law saves the future of commercial UAVs to project and claim the right to airspace in order to have a comprehensive infrastructure right of way of the UAVs.

Hence, section 3(1) of the Land Acquisition Act 1960 explains the authorization given to the State Authority to acquire any land with objectives among others:

“(a) for any public purpose;
(b) by any person or corporation for any purpose which in the opinion of the State Authority is beneficial to the economic development of Malaysia or any part thereof or to the public generally or any class of the public; or

⁹⁹ *Beh Chew Tai & Ors v DC & A Developments Sdn Bhd* [2023] MLJU 626.

¹⁰⁰ Noor & Peng, 139.

¹⁰¹ Land Acquisition Act 1960 (Act 486), s 2.

(c) for the purpose of mining or for residential, agricultural, commercial, industrial or recreational purposes or any combination of such purposes.”¹⁰²

In brief, section 3(1)(a) of the Act provides a general objective that anything that serves as a public interest will be subject to compulsory land acquisition. Furthermore, section 3(1)(b) of the Land Acquisition Act 1960 provides the acquisition of land by the State Authority from any person or corporation shall be in the view of the State Authority is necessary for the economic development of Malaysia or any part thereof, or to the public generally or any class of the public. This proviso departed from sub-clause (a) where the acquisition of the land can be done for a small class of the public instead of the public as a whole so long it is under the Malaysian economic plan. Moreover, sub-clause (c) also highlights classes of the objective of compulsory acquisition of land which is more towards the private purpose and not served publicly. Any acquisition made under paragraphs (1)(b) and (c) shall be supplemented by the project proposal of the intended acquisition, the layout acquisition plan together with the government valuation report of the land to be acquired and the prescribed fees.¹⁰³ Such application of the acquisition will be transmitted to the State Economic Plan Unit,¹⁰⁴ for their consideration based on section 3A of the Land Acquisition Act 1960 which mentions as follows:

“The State Economic Planning Unit, or the Committee for the Federal Territory of Kuala Lumpur, as the case may be, shall consider the application referred to in subsection 3(4) on the following aspects:

- (a) public interest;
- (b) the capacity and capability of the applicant to carry out the purpose for which the land is to be acquired;
- (c) the feasibility of the project; and

¹⁰² Land Acquisition Act 1960, s 3(1).

¹⁰³ Ibid., s 3(3).

¹⁰⁴ Ibid., s 3(4).

(d) the development approval granted to the registered proprietor.”¹⁰⁵

The process of acquisition indeed involves a series of negotiations, investigation and due process with the proprietor to ensure the interest of the proprietor is protected by the laws. From the perspective of commercial UAVs, the last resort for the government to line up the right of way for commercial UAVs is by integrating it with the State in exercising the power to compulsorily acquire the airspace. Since airspace is within the definition of land thus, the Land Acquisition Act 1960 shall also be applicable and extended to airspace as well. This airspace acquisition is never been applied in Malaysia except the attachment of acquisition is together with the acquisition of reasonable airspace as well. All provisions of section 3(1)(a) until (c) of the Land Acquisition Act can be used in respect of commercial UAVs for several different approaches. It will be easy to draw the compulsory airspace acquisition if commercial UAVs are one of the national economic plans.

The compensation in the compulsory acquisition is protected under the law and is regarded as a constitutional right of the proprietor. In the case of *Pentadbir Tanah Daerah Gombak v Huat Heng (Urn Low & Sons) Sdn Bhd*,¹⁰⁶ the Supreme Court held that the fundamental rule of compensation is that the amount granted should, to the greatest extent possible, put the recipient in the same financial situation as he or she would have been in had there been no question of the land's being forcibly taken.¹⁰⁷ In addition, the amount of compensation should be on the principle of fair market value. In other words, the proprietor shall receive compensation based on the current market

¹⁰⁵ Land Acquisition Act 1960, s 3A.

¹⁰⁶ *Pentadbir Tanah Daerah Gombak v Huat Heng (Urn Low & Sons) Sdn Bhd* [1990] 3 MLJ 282; [1991] 1 CLJ 16.

¹⁰⁷ *Ibid.*

value of the property. In the case of *Perbadanan Kemajuan Pertanian Selangor v JW Properties Sdn Bhd*,¹⁰⁸ the Federal Court held as follows:

“the fact that the land is subject to a restriction-in-interest which requires the prior consent of the state authority before its transfer does not change the legal position that a fair compensation ought to be made for compulsory acquisition of such land or an interest in such land.”¹⁰⁹

Schedule 1 of the Land Acquisition Act 1960 provides how to determine the market value of the property. The valuer may use any appropriate method of valuation to determine the market value of any scheduled land, provided that consideration is given to the prices paid in recent sales of nearby properties with comparable features to the scheduled land, with special attention paid to the last transaction on the scheduled land within two years of the date intended acquisition.¹¹⁰ When only a part of the land is to be acquired, the market value of the scheduled land shall be calculated by referring to the entirety of the land as represented in the document of title of the scheduled land and after taking into account the distinctive attributes of that part.¹¹¹ Since the legislation permits the acquisition of both partial and full parcels of land, the acquisition of airspace is also conceivable. The market value of the proprietor's airspace is equal to the land's value. The layout design for acquiring the airspace will be made either vertically, which is only the reasonable airspace, or horizontally, which includes the land.

¹⁰⁸ *Perbadanan Kemajuan Pertanian Selangor v JW Properties Sdn Bhd* [2017] MLJU 1107; [2017] 8 CLJ 413.

¹⁰⁹ *Ibid.*

¹¹⁰ Land Acquisition Act 1960, schedule 1, para 1 (1A).

¹¹¹ *Ibid.*, schedule 1, para 1 (1B).

The leading case of land acquisition happened in 1946 in the case of *United States v Causby*¹¹² which also highlighted the *ad coelum* principle. The military's conduct of such flights was interpreted by the public as the government violating the owners' right to their land's airspace, leading to the case, which the courts recognised as an infringement on the owners' property rights. The proprietors of the land were successfully awarded damages for the value of easement by the military flight in the low altitude over their lands. The amount of damages awarded was considered as the value of consideration of such taking which the military and the government took for the acquisition of low-altitude airspace.

This case can be referred to the situation of UAVs as well as the UAVs usually fly in low-altitude airspace and surely will invade the future enjoyment of the proprietors of the land thus, to credit the use of commercial UAVs in Malaysia, the government and State shall be ready to compensate and the proprietors of the land for the compulsory acquire the low-altitude airspace for the usage of commercial UAVs. This method is surely a last resort where intervention by the State is needed to have a right to airspace for commercial UAVs. The State frequently exercises compulsory acquisition of private land involving airspace in areas near airports. This can also be applied to commercial UAVs operating in low-altitude airspace. This method may reduce the floodgate claim of trespass and provide a legal route for UAVs in low-altitude airspace.

¹¹² *United States v Causby* (1946) 328 U.S. 256.

4.7 TRESPASS TO PRIVATE PROPERTY- UNDETERMINED AIRSPACE BOUNDARIES

The law of trespass was developed as a right to exclude others from entering, using or even enjoying the land of the proprietor. The subject matter involved in the law of trespass is the land itself. The proprietor shall prove the absolute ownership of the said land to claim the law of trespass which has been infringed by the defendant. Trespass is defined as physical interference in which one person physically enters another's land without permission, resulting in an actionable trespass. Aerial trespass, on the other hand, is defined as encroaching on the proprietor's lower-altitude airspace. Unlike the ground level of the land, the boundaries are easily determined by proper measurement of the said land, the aerial airspace that forms a part of the proprietor's land faces undetermined airspace boundaries. Consequently, the aerial airspace of the proprietor is undeterminable as to what altitude is considered reasonable. The standard of reasonableness is likewise subjective, varying from case to case or depending on the Court's discretion in determining it. A UAV that enters that space above an unpermitted pathway due to negligent piloting may be considered a physical entry.¹¹³ In the case of *Leigh v. Skyviews & General Ltd. (Bernstein)*,¹¹⁴ the defendant firm Skyviews took a single aerial photograph while flying over the plaintiff's country home. The plaintiff asserted his right to prohibit any access into the airspace above his property. The court ruled that a proprietor's rights are not boundless and are restricted to the height of an ordinary user. The court further observed that the right of a proprietor to the airspace

¹¹³ Valentine, S., "Geophysical trespass, privacy, and drones in oil and gas exploration", *Journal of Air Law and Commerce*, 84(3), (2019): 525.

¹¹⁴ *Bernstein of Leigh v Skyviews & Gen. Ltd.* [1977] 3 WLR 136.

above his property is restricted to the height necessary for the ordinary use and enjoyment of his land and the structures on it.¹¹⁵

The case of *Spektra Segmen Sdn Bhd v TC Autoworld Sdn Bhd*,¹¹⁶ highlighted the issue of trespass. The plaintiff and defendant are both locally registered limited companies that possess adjacent lands that are the subject of the dispute. The plaintiff filed the claim on trespass on the basis that there was the encroachment of buildings and structures on the defendant's land into the plaintiff's land, both above and ground, causing losses and harm to the plaintiff. The court ruled that for the cause of action under trespass to succeed the following matter shall be taken into consideration as follows:

“(a) There is an entry and/or intrusion into the claimant’s legal property by the respondent; and (b) That the said entry and/or intrusion must be unlawful, unjustifiable, unwarranted and/or without any legal right for the respondent to do so.”¹¹⁷

Encroachment on private airspace will be regarded as trespass to land in the context of UAVs since the law states that the proprietor's rights over the surface of the land are not limited to the amount of beneath the land as well as the reasonable use of airspace. The nature of UAVs flying and hovering in the airspace could be regarded as unreasonable interference and an active intrusion, but this is difficult to prove due to their visibility of airspace boundaries, which varies from case to case.

In the USA, operators must exercise caution to ensure that UAVs only operate below the National Airspace System (NAS) over permitted land. Prior to the 2016 rule, the FAA of the United States did not allow commercial UAV operations without prior

¹¹⁵ *Bernstein of Leigh v Skyviews & Gen. Ltd* [1977] 3 WLR 136.

¹¹⁶ *Spektra Segmen Sdn Bhd v TC Autoworld Sdn Bhd* [2018] MLJU 819.

¹¹⁷ *Ibid.*, 829.

approval through an exemption process. The FAA Modernization and Reform Act ("FMRA"), which Congress passed in 2012 to give the FAA jurisdiction over UAV regulation, was used to grant this exemption. The Secretary of Transportation allowed exemptions for the use of commercial UAVs under section 333 of the FMRA if he assessed that the UAV could operate safely within the NAS.¹¹⁸

Even though the UAV law in the United States has undergone major modifications, the legal question of trespass remains unresolved because the law is silent on the subject. However, aerial trespass is rarely brought to the attention of the court in Malaysia, so the discussion of trespass in Malaysia is limited to the surface of the land. The CAAM only concerns the issue of trespass of navigable airspace but not into low-altitude airspace. In general, UAVs are not allowed to fly in Malaysia's navigable airspace, which is set at 500 metres above the ground. This restriction is not absolute, as the CAAM may award a commercial UAV permission to operate within navigable airspace if it receives special consent to fly in EVLOS or BVLOS airspace. According to *Causby*,¹¹⁹ the navigable airspace is considered a public highway, therefore any aircraft that flew within it would not be subject to a trespass complaint from a private proprietor. As a result, proprietor airspace ownership is often limited and does not extend beyond navigable airspace. Navigable airspace, as defined by the Federal Aviation Regulations (FAR), is airspace above the minimum altitudes of flight stipulated by (the FAR), including airspace essential to assure safety in aircraft take-off and landing. The FAR establishes minimum safe altitudes of 1,000 feet over the highest obstacle in crowded regions and 500 feet above the surface in non-congested areas,

¹¹⁸ Page, L., "Drone Trespass and the Line Separating the National Airspace and Private Property", *George Washington Law Review*, 86(4), (2018):1157.

¹¹⁹ *United States v Causby* (1946) 328 U.S. 256.

however, helicopters and powered parachutes are exempted from these minimums in certain circumstances.¹²⁰

Trespass involves encroaching on a proprietor's land without the proprietor's prior consent. Trespass is referred to as a direct physical invasion of another person's property. The common law view of airspace held that whoever owned a specific piece of land owned everything. However, the boundaries of airspace property rights remain ambiguous, making it difficult to determine when UAV use becomes trespassing. The Restatement (Second) of Torts mentions trespass occurs when an aircraft enters into the immediate reaches of the airspace adjacent to the land and; considerably interferes with the other's use and enjoyment of his land.¹²¹ This provision, on the other hand, does not specify where the proprietor's airspace ends. The phrase "immediate reaches" is ambiguous in determining the proprietor's aerial borders. The court concluded in *Hinman v. Pacific Air Transport*,¹²² that a commercial airline's continuous flights less than 100 feet over the plaintiff's property did not constitute trespass since they did not hinder the plaintiff's full enjoyment of the land and did not inflict any actual or material damage. The court did not define "in connection with the enjoyment," but implied that this right fluctuates depending on a property owner's needs and that an owner owns the portion of the air he uses "just for as long as he uses it."¹²³ The Ninth Circuit clarified that a land owner's airspace rights do not extend eternally upwards, but rather that he only owns airspace that he can occupy or use "in conjunction with that land's enjoyment."¹²⁴ Furthermore, in *United States v. Causby*,¹²⁵ the court held that planes

¹²⁰ Page, 1160.

¹²¹ Restatement (Second) Of Torts (Am. Law Inst 1965), s 159.

¹²² *Hinman v Pacific Air Transport* (9th Cir. 1936) 84 F.2d 755.

¹²³ *Ibid.*, 758.

¹²⁴ *Ibid.*, 756.

¹²⁵ *United States v Causby* (1946) 328 U.S. 256.

flying low and frequently over a proprietor's property infringed on his property rights and constituted a taking when they caused him actual damage.¹²⁶ Trespass does not require physical occupation of the land if the proprietor can demonstrate that the trespasser is occupying the airspace in such a way that the proprietor is unable to use the land for his enjoyment.¹²⁷

Courts will have to figure out where the public navigable airspace begins and what constitutes the “immediate reaches” of a property owner's land to determine whether a UAV flight is a trespass. Due to the steadily increasing UAV activity, there is a great need for clear regulations, despite the need for other commercial UAV infrastructure. In terms of UAV development and airspace trespass, a few states in the United States have enacted their UAV legislation to regulate aerial trespass by flying UAVs. Nevada, for example, passed legislation in 2015,¹²⁸ that allows a property owner to sue a UAV operator for trespass if the drone is flying less than 250 feet above the property owner's land.¹²⁹ The Oregon legislature amended a 2013,¹³⁰ UAV trespass statute in 2016, which is nearly comparable to the Nevada law except that it does not require a property owner to sue a UAV operator at a minimum height of flight.¹³¹ The Oregon UAV law originally indicated a minimum altitude of 400 feet, however, it was revised in 2016 to remove the height altitude to prevent conflict with FAA regulations and pre-emption issues. Louisiana's general trespass statute was revised to expressly include UAVs, making it illegal to fly a UAV over someone else's property to conduct surveillance on the property or an individual on it.¹³² California also tried to pass a bill

¹²⁶ *United States v Causby* (1946) 328 U.S. 259.

¹²⁷ *Ibid.*, 268.

¹²⁸ Nev. Rev. Stat, 103, s 493.

¹²⁹ Page, 1166.

¹³⁰ Or. Rev. Stat. Ann, 380, s 837.

¹³¹ Page, 1166.

¹³² LA. Stat. Ann 2016, s 14:63.

in 2015,¹³³ that would create a cause of action for UAV trespass. UAV flights below 350 feet and over private property would have been considered trespassing under the law. Oklahoma law forbids flying UAVs within 400 feet of critical infrastructure and imposes civil penalties for violations.¹³⁴ A Tennessee law makes it illegal to fly UAVs within 250 feet of critical infrastructure for surveillance purposes. Finally, it is a violation of Texas law to fly UAVs less than 400 feet above critical infrastructure.¹³⁵

According to Article 75 of the Federal Constitution of Malaysia, if there is any inconsistency between State law and Federal law over one subject matter, it is conclusive that Federal law will prevail. As a result, the State must exercise extreme caution when drafting UAV regulations so that they do not violate the Civil Aviation Act. What the states and municipalities can do is pass legislation that falls within the State List of the Federal Constitution's Ninth Schedule. As a result, the State's UAV regulation will have an impact on land matters, including trespassing issues. This is to avoid overlapping jurisdiction and the failure of Article 75 of the Federal Constitution to render the law ineffective if each state regulates its UAV law. Aerial trespass for UAVs is a relatively new concern in Malaysia, with no laws or regulations on the subject. Conversely, historically in the USA, the FAA has delegated control of airspace below 500 feet to the states.¹³⁶ The FAA also argued that private property rights and trespassing issues are outside the scope of the new UAV rule and that these issues can be addressed through state legislation.¹³⁷ Prior consultation with the relevant agency, particularly the CAAM, is recommended before creating and drafting the UAV trespass regulations, particularly those involving the restriction clause, safe landing, altitude

¹³³ S.B. 142, 2015, Leg., Reg. Sess.Cal. 2015.

¹³⁴ Okla. Stat. Ann West Supp 2018, tit. 3, s 322.

¹³⁵ Page, 1167.

¹³⁶ Valentine, 513.

¹³⁷ Page, 1169.

setting, and operational clauses. This is important to emphasise because uniform regulation that standardises and applies to all states is especially important for commercial UAVs since commercial activity typically involves other states' jurisdiction. In contrast, if the subject matter involves navigable airspace, the matter is decided at the federal level. As of now, the UAV airspace has yet to be declared and integrated into navigable airspace.

The CAAM shall precisely define the limits of the navigable airspace, which would dictate exactly where UAVs shall fly, to clear the uncertainty in the jurisdiction line in UAV legislation, particularly in aerial trespass. As a result, state and local governments would be able to establish UAV rules below the navigable airspace without fear of pre-emption.¹³⁸ The first step toward realising CAAM's mission of integrating navigable airspace for both manned and unmanned aircraft by 2035, in tandem with the ICAO's mission, is to define current navigable airspace to include UAVs. It is possible to avoid claims of aerial trespass by declaring the UAV to be part of navigable airspace. As a result, the CAAM has complete control over all navigable airspace for manned and unmanned aircraft, including UAVs. The State shall have no authority to decide such a matter because it is incontrovertible under the Federal List of the Federal Constitution. After all, navigable airspace is a matter of aviation under the federal government's control. If the Federal Government is serious about integrating commercial UAVs into the Malaysian economy, declaring UAVs as part of navigable airspace is considered a critical matter. The CAAM and, thus, the states' respective jurisdictions will be determined by a clear definition of navigable airspace. This precise definition will also help illuminate personal property rights and determine when a drone

¹³⁸ Page, 1173.

is trespassing. The proposal to have a designated line of navigable airspace for UAVs is based on the jurisdictions and matters enumerated in the Ninth Schedule, First List of the Federal Constitution,¹³⁹ which can be illustrated in Figure 4.2 as follows:

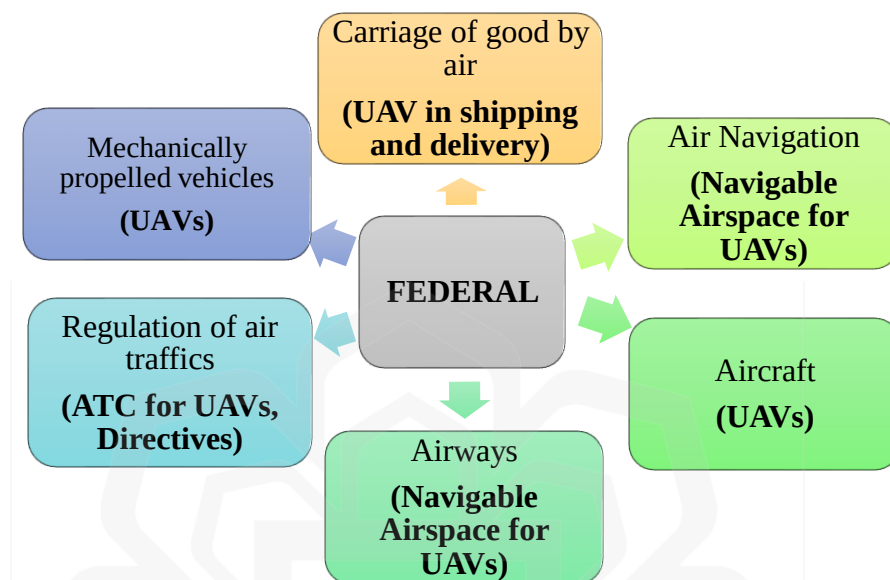


Figure 4.2 The Concept of UAVs and Navigable Airspace in Federal List of the Ninth Schedule of the Federal Constitution.¹⁴⁰

Aerial trespass should be measured by airspace altitude, as the United States has mandated in their UAV legislation. Anything above 200 feet would be considered navigable airspace under an effective definition, giving the FAA exclusive power over this area and resolving any disputes about pre-emption and the state's power to control above this level.¹⁴¹ This 200 feet barrier on navigable airspace would not only designate where the FAA has exclusive jurisdiction, but it would also establish a minimum height over which both commercial and recreational UAVs must fly, thereby granting them a

¹³⁹ Federal Constitution, (Malaysia), item 10 (c) until (f) of the first list of the Ninth Schedule.

¹⁴⁰ Ibid.

¹⁴¹ Page, 1173.

200 feet radius under current UAV regulations.¹⁴² For both recreational and commercial purposes, the United States has specified a minimum navigable airspace altitude of 200 feet. Still, the 200 feet of navigable airspace will ensure that proprietors may enjoy their airspace to the fullest extent possible. As a result, any commercial UAV that encroaches on private people's airspace by flying below 200 feet may be charged with aerial trespass unless the owner has given prior approval or a navigation easement has been established between the proprietors and the commercial UAV's operators. The proprietors will have adequate space to prevent drones from flying over their property and interfering with their use of that land if they are at least 200 feet above ground level.¹⁴³ Additionally, 200 feet will provide ample space above typical proprietors' properties while also providing adequate room for future drone innovation. These 200 feet gaps, for example, will allow different types of drones to travel through transit zones and will allow a drone to fly above private property without the operator worrying that the flight is trespassing.¹⁴⁴

The principle of the reasonable use of airspace shall be integrated to entrench the legislation itself in order to determine aerial trespass. How much will the owner use the airspace for his purposes? Is it fair to consider a height of 200 feet or 500 feet? The proprietors would have sufficient airspace property rights at 500 feet, but this enormous height is unnecessary and, more critically, would jeopardise UAV technology's future.¹⁴⁵ The prohibition and restriction on flying UAVs beyond 400 feet, on the other hand, would make commercial UAV flights unsustainable. The introduction of

¹⁴² *Federal Aviation Administration*, "Federal Register, Rules and Regulations", vol. 81, no. 124, (28 June 2019): 42119, <<https://www.govinfo.gov/content/pkg/FR-2016-06-28/pdf/2016-15079.pdf>> (accessed on 19 June 2023).

¹⁴³ McNeal, G. S., "Drones and the Future of Aerial Surveillance", *George Washington Law Review*, 84(2), (2016):400-01.

¹⁴⁴ Page, 1174.

¹⁴⁵ Ibid.

commercial UAVs into the sky has raised new legal issues concerning take-off and landing zones, particularly when it comes to UAV delivery services. Take-off and landing usually necessitate spaces that touch the land's ground level. As a result, in the delivery service, the commercial UAV must obtain prior consent for the take-off and the landing from the receiver or proprietor of the land, which is either included in the cost of delivery services or obtained through the avigation easement.

The concept of protecting the interests of private property owners is not without restriction.¹⁴⁶ Although the general rule of trespass law allows the proprietor to assert and protect ownership of all lands on the surface, beneath, and above the surface of the land, the proprietor has the right to exclude all others from using, possessing, or enjoying his or her land. The concepts of ownership and possession have different legal implications. This exclusion will be deemed reasonable if the consent or agreement of the parties involved is obtained for a win-win situation. The exclusion clause for trespass or privileged trespass may be in the form of granting the right to use airspace by leasing or easement of the airspace.

4.8 THE ISLAMIC JURISPRUDENCE ON AIRSPACE OWNERSHIP AND TRESPASS

In the general perspective, the usage of UAVs in the commercial arena is based on the objective shariah (*maqasid shariah*), the hierarchy of commercial UAVs most probably falls under *tahsiniyyah* which may be desirable only to perfect the circle of livelihood. The urgency of commercial UAVs depends on the relevant sectors. Conversely, in certain circumstances for example, in reference to the Covid-19 pandemic, the

¹⁴⁶ Shbeeb, J, "Thou Shalt Not Drone Thy Neighbor", *Liberty University Law Review*, 13(1), (2018): 65.

commercial UAV will become *hajiyyah* and even *daruriyah* if the UAV can reduce the risks of infection from the virus, especially in delivering medical samples and tests for the protection of life. The concept of *hajiyyah* for commercial UAVs can only be reflected in a certain sector of the economy. The commercial UAV is relevant in the hierarchy of *hajiyyah* in the agriculture sector due to the shortage of labour in the said industry. The efficiency of commercial UAVs in agriculture is further linked to the production of national commodities and thus complementary to establishing ease and removing hardship.

One Islamic legal maxim that is relevant to highlight *vis-à-vis* commercial UAVs is *al-umuru bi-maqasidiha* where the matters will be judged by the objective and purpose.¹⁴⁷ According to Ibn Taymiyya, the scope of this maxim encompasses the moral imperative that individuals and groups endure for the ripple effects of potentially harmful actions when those implications are predictable and avoidable.¹⁴⁸ This maxim implies that a Muslim should appropriately set goals in particular areas by anticipating the consequences. Similarly, the commercial UAV is appraised based on its goal, and commercial UAV goals vary depending on the sector and urgency.

Moreover, the approach and method of Islamic jurisprudence are the most suitable to highlight Islamic perspectives in determining the ownership of airspace to inspire the extent of rules and regulations on airspace ownership and trespass. The Islamic principle on the concept of land ownership gives rise to the customary practice of the society in adaption to the extent of rights of proprietors over the airspace as well as the beneath of the land. The ownership of land is key to the principle of protection

¹⁴⁷ *Da'wah institute of Nigeria & Islamic Education Trust*, "Shari'ah Intelligence the Basic Principles and Objectives of Islamic Jurisprudence. An Introduction to Usul al-Fiqh and Maqasid al-Shari'ah", (2015): 151.

¹⁴⁸ *Ibid.*, 152.

of property in line with *maqasid shariah*. With references to various Quranic verses on the concept of land ownership, is vested absolute to the Almighty Allah who is the owner of all-inclusive and exclusive heaven and the earth. Allah mentions in the Holy Quran, “It is He who has made the earth manageable for you, so traverse through its tracts and enjoy the sustenance He furnishes but unto Him is the resurrection.”¹⁴⁹ Allah said further, “All that is in the heavens and on the earth belong to Allah s.w.t.”¹⁵⁰ These Quranic verses crystalized the absolute ownership of the whole earth and heaven to Allah. The creation and appointment of humans as a vicegerent on the earth indicate that humans only hold property as a trust given by Almighty Allah to manage justly and properly based on divine revelation. The Quran mentions the creation of humans as the vicegerent on the earth showing the special position of humans who are bestowed by Allah with *aql* to manage the earth wisely though the consequence of the acts that they choose was either sometimes in line with the Islamic principle and *sunnatullah* or maybe not. Further, Allah said in the Quran as follows:

“And when thy Lord said to the angels: 'I am about to place a vicegerent in the earth, they said: Wilt Thou place therein such as will cause disorder in it, and shed blood? and we glorify Thee with Thy praise and extol Thy holiness.' He answered: 'I know what you know not.’”¹⁵¹

Moreover, Allah mentions in the Quran, “And spend of that whereof He has made you His vicegerents.”¹⁵² The delegation of authority by Allah to humans in managing the earth is subject to the strict rules dictated by Allah. It can be inferred here that the airspace up to the navigable airspace belongs to Allah and humans do own the

¹⁴⁹ Al-Mulk, 67:2.

¹⁵⁰ An-Nisa, 4: 126 & 134.

¹⁵¹ Al-Baqarah, 2:30.

¹⁵² Al Hadid, 57: 7.

airspace in trust to utilize it justly so long it is beneficial to society. In sum, the concept of land ownership in Islam is based on the concept of trust and agency, where humans on this earth as the agents to utilise resources provided by Allah to bring benefit to the whole community.

The limitation and restriction of ownership in Islam have glorified the relationship of humans as a servant of Allah. The Ottoman Code of 1858, a codification of Islamic land principles, identified four primary categories of property tenure that stemmed from Islamic legal sources: first is full ownership (*mulk*), which can also be translated as full private ownership or freehold in Western terminology; second is state-owned property (*miri*), which the state holds as Allah's agent and in the trust of the Muslim community, and over which a variety of access and usufruct rights for individuals can be formed; third is endowed land (*waqf*) is the property that has been permanently settled for the benefit of beneficiaries, either for specified purposes or for the general good; and fourth is unused or dead land (*mawat*) that can be restored and transformed into private land.¹⁵³ Private ownership is encouraged in Islam, as long as it does not harm others or the community. Nonetheless, even though such ownership is predicated in Islam, the State reserves the right to take it from him if the need arises or if it is for the betterment of society (*maslahah*).¹⁵⁴ The UAV's airspace could be categorized under *mawat* due to the unutilised airspace which ranged at altitudes from 200 feet to 400 feet from the surface of the land, which is situated in between of proprietors' airspace and the navigable airspace. The concept of *mawat* land is to bring the uncultivated land into alive (*Ihya al-mawat*) generally to revive and rehabilitate the

¹⁵³ Sait, S & Peters, B., "Islamic Principles and Land Opportunities for Engagement", *United Nations Human Settlements Programme (UN-HABITAT)*, (2011):9.

¹⁵⁴ Siti Mariam Malinumbay S. Salasal, "The Concept of Land Ownership: Islamic Perspective", *Buletin Geoinformasi*, vol. 2 no.2, (1998): 289.

said land. A similar approach can be used analogically to the navigable airspace of UAVs. Since *mawat* land is uncultivated and has no owner, however, some claim that ownership is vested in the state and that individual acquisition proceeds through rehabilitation, with or without the state's authorization, by cultivation, occupation, or construction in compliance with *Shari'ah* principles.¹⁵⁵

Mawat airspace here can later be claimed as the navigable airspace for the UAVs by the CAAM which later is most likely will be converted into *miri* for the integration of both navigable airspaces of manned and unmanned aircraft. The following are some of the pertinent hadith reported in relation to the practice of *Ihya al-Mawat*:¹⁵⁶ “He who brings a dead land back to life will own it, and he who seeks to utilise it by force has no right or title to it at all.”¹⁵⁷ Furthermore, it was narrated by Sa'eed bin Zaid “Whoever revives dead land, it is his, and that which is unlawfully planted confers no rights,” says another hadith of the Prophet (pbuh) on *mawat* land.¹⁵⁸ The operation of UAVs in the airspace is considered as bringing *ihya* to the *mawat* land especially when involves commercial and trade arrangements. Further, it is permissible to lease the airspace for commercial UAVs if involves the private airspace in line with the hadith of the Prophet, narrated by ‘Amr, “It is permissible to rent the land for cultivation, One had better give the land to one's brother gratis rather than charge a certain amount for it.”¹⁵⁹ This enshrined the concept of easement of land as per the National Land Code (Malaysia).

Besides the primary sources of Islamic law which are the *al-Quran* and the *Sunnah* of the Prophet (pbuh), the secondary sources of Islamic law also are

¹⁵⁵ Siti Mariam, 298.

¹⁵⁶ Ibid., 297.

¹⁵⁷ *Sahih Al Bukhari*, translated by M.Muhsin Khan, vol. 3, book 39, no. 528, (2009): 528-529. <https://d1.islamhouse.com/data/en/ih_books/single/en_Sahih_Al-Bukhari.pdf> (accessed on 16 June 2022).

¹⁵⁸ *Sunan Abu Dawud*, translated by Nasiruddin al-Khatta, Darussalam Global Leader in Islamic Book, (Riyadh: 2008), vol 3, book 19, no. 3073, (184): 541. Also mentioned in Hadith number 3076:542.

¹⁵⁹ *Sahih Al Bukhari*, vol. 3, book 39, no. 534: 530.

continuously being used by Muslim scholars in deriving *hukm* until today. One of the secondary laws that are relevant under this discussion is 'Urf. The Arabic term 'Urf is referring to custom and knowledge. 'Urf connotes the customary practice of a given society that is acknowledged and well accepted by the society and regarded as compatible norms with the *Shari'ah* law. The repetitive and common practice in society becomes a good norm and is well-accepted to constitute a custom. 'Urf is different from one society to another society and thus cannot be applied and transplanted directly to one society. The Prophet's approach toward Arab tribes and other ethnic groups sets a crucial precedent and serves as a fundamental benchmark in Islamic law. The Prophet endorsed a wide range of cultural norms and did not change them unless it was necessary which is based on the maxim of *al-'adah muhakkamah* which refers to custom as a basis of law.¹⁶⁰ 'Urf cannot be invoked in cases which have a clear *hukm* from the *naskh* on obligatory (*fard/wajib*) or prohibited (*haram*). Although the primary sources are silent on one *hukm*, the Muslim jurists are prepared to utilize the availability of secondary sources of *al-qawaid fiqhiah*. 'Urf can be applied in the context of the transaction (*muamalah*), but not in the context of worship.¹⁶¹ When 'urf is contradictory with divine commands in *al-Quran* and the *Hadith* (*naskh*), 'urf must be denied, forming a constraint in the application of urf. Urf can be further divided into two categories: 'urf *shahih* and 'urf *fasid*.¹⁶² 'Urf *shahih* is a type of 'urf that does not contradict *syara*. 'Urf must be preserved in the evolution of Islamic law and justice since it is in line with societal requirements and the collective good.¹⁶³ Furthermore, 'urf *sahih* is divided into 'urf *amm* and 'urf *kuhash*. 'Urf *amm* generally involves a business transaction that is well

¹⁶⁰ Da'wah Institute of Nigeria & Islamic Education Trust, 162.

¹⁶¹ Yamamah, A., "The Existence of Al-Urf (Social Tradition) in Islamic Law Theory", *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, vol 21, issue12, ver. 7 (2016): 45.

¹⁶² Ibid.

¹⁶³ Ibid.

accepted and as a practice of the people and considered as a good norm and agreed by people at any time. As a consequence, '*urf amm*' generally impacts the development of a common rule of law in the community. Whereas '*urf khash*' is '*urf*' applicable to a country or a specific group, such as '*urf*' among traders. Conversely, '*urf fasid*' is '*urf*' that is at odds with and opposes *syara*' This '*urf fasid*' cannot be acknowledged because it violates the *syar'i* that has been agreed upon.¹⁶⁴

The existence of UAVs is considered a contemporary approach to moulding the new digital and technology era. Although, UAVs in the contemporary world did not exist previously in the period of Prophet Muhammad (pbuh) and the Companions but the Muslim jurists shall be ready to line up the UAVs' laws by referring to the '*urf*' of the society. The adaptation of society into commercial aviation gives rise to the customary practice and norms thus regulation connected to UAVs may be inferred according to the '*urf*'. The repetitive practising the norm and customary practice in lining up the ownership of airspace is reliable by looking at the history and the development of the aviation industry as well as navigable airspace of manned aircraft set by the ICAO which has become a customary international law and well accepted worldwide at the altitude of 500 feet from the surface of the land. Good practice in the international aviation industry is recognizing the navigable airspace of manned aircraft created '*urf amm*'. Meanwhile, the changes and adaptation of segregating UAV airspace as of today will later develop '*urf khash*'. This is because only certain developed societies have accepted UAVs in the commercial arena.

The initiative by ICAO years by year, decades by decades in integrating both navigable airspaces of manned aircraft and UAVs also could be considered '*urf*' if all the

¹⁶⁴ Yamamah, 45.

contracting parties agreed to such an arrangement and transplanted it into the national law. 'Urf of navigable airspace of manned aircraft of 500 feet from the surface of the land is a prima facie norm that is accepted by all parties to the Chicago Conventions. So long the 'urf neither violates public interest nor violates private property therefore the said 'urf is in line with Islamic principles. There is no harm inflicted on *Shariah* when following the rules set by ICAO. Although UAVs have existed since 1980 in Japan,¹⁶⁵ the adaptation of UAVs commercially is considered novel in most countries as the segregation of UAV airspace of today is still in the grey area and is yet to be determined and finalized by the ICAO. Soon, when commercial UAVs are used by all sectors of the economy in one society, the changes as to the acceptable practice in lining up airspace and laws connected with the UAVs will become a good norm and consequently be accepted as 'urf amm so long there is no contradiction and contravene with the *naskh* from *al-Quran* and *Sunnah* of the Prophet Muhammad (pbuh). For the time being, the navigable airspace for commercial UAVs can be concluded as 'urf khash.

The rapid development in the aviation industry has given rise to the development of regulations and laws connected to other advanced technologies. The uniformity of regulations set by ICAO is a conclusive approach to the creation of international customary law with regard to the minimum limit of navigable airspace of manned aircraft. Due to that, the altitude of 500 feet from the surface of the land can be inferred as 'urf amm and regarded as the maximum line altitude for UAVs. However, the segregation of airspace between the proprietors' and the UAV's airspace is yet to become 'urf amm as the approach of the countries worldwide may be different. In a

¹⁶⁵ Sheets, K. D, "The Japanese Impact on Global Drone Policy and Law: Why Laggard United States and Other Nations Should Look to Japan in The Context of Drone Usage", *Indiana Journal of Global Legal Studies*, 25(1), (2018): 513-538.

normative condition, society embraces cultural standards that are appropriate for them and the circumstances, times, and locations in which they live.¹⁶⁶

The legal issue that is usually attached to the concept of airspace ownership, is the restrictive and limited usage of the ownership. This will give rise to the trespass issue. The Holy Quran mentions as follows:

“O ye who believe! enter not houses other than your own until you have asked permission and saluted the inmates thereof. That is better for you, that you may be heedful.”¹⁶⁷

This highlights the manner in acknowledge the ownership of private property. Moreover, the protection of the property is to preserve the ownership and possession of the owner unless the owner himself gives such consent to disregard his rights. In application of trespass also involves encroachment over the proprietors' ownership unless prior consent is given by the proprietor. The value in UAVs' airspace which is right above the proprietors' airspace will later create a controversial legal claim to the possibility of airspace trespass by the UAVs. Moreover, the Qur'an also expressly forbids believers from encroaching on another's property unless they do it legally, through lawful trade, or by consent.¹⁶⁸ Further, a hadith of the Prophet (pbuh) highlights a similar approach, “Everything that belongs to a Muslim, including his property, life, and honour, is forbidden to his fellow Muslims.”¹⁶⁹ The prohibition of trespass in Islam demonstrates the recognition of private individuals' conditional ownership of land. The manner in which prior consent is sought from the proprietor demonstrates the Islamic

¹⁶⁶ *Da 'wah Institute of Nigeria & Islamic Education Trust*, 163.

¹⁶⁷ *An-Nur*, 24:28.

¹⁶⁸ *An-Nisa*, 4:29.

¹⁶⁹ *English Translation of Sunan Ibn Majah vol 5*, translated by Nasiruddin al-Khattab, Darussalam Global Leader in Islamic Books, (Riyadh: 2007), hadith no. 3933: 167.

value of protecting an individual's property. The Islamic legal maxim of *al-asl fil ashya'* *al-ibahah* which refers to the norm concerning things is that of permissibility where the *hukm* connected to the UAV is regarded as permissible (*mubah*) due to the natural state of UAVs until the permissibility becomes prohibition. The basic rule for *'urf* is permissible, thus the burden of proof for whether or not a customary convention is impermissible falls only on those who oppose it, not on those who affirm it.¹⁷⁰ Therefore, in relation to the trespass by UAVs, the rule of the permissibility of *'urf* can be aborted by the prohibition to enter the property of fellow *Muslims*.

4.9 NUISANCE- UAVs UNREASONABLE INTERFERENCE

A nuisance impedes a private owner's otherwise legal use of his or her property. The law on nuisance can be divided into two spectrums; 1) public nuisance and 2) private nuisance. In the instance of a UAV, the appropriate claim would most likely be one of private nuisance from someone whose peaceful enjoyment of his or her land has been disrupted in some way by the UAV.¹⁷¹ Nuisance can be triggered by an indirect act of interference and so encompasses invisible invaders such as noise, odour, and offensive sights, as well as more palpable invasions such as fire, leaves, water, and dust.¹⁷² The legal issue of nuisance arises with commercial UAVs when the sound of vibration from the flying UAV causes undue interference. Despite the trespass claim, the commercial UAV is likely to face legal action for nuisance. The nuisance suit is primarily concerned with noises from commercial UAVs. The EASA Commission Implementing Regulation (EU) 2019/947 mentions in preamble 22 the issue of nuisance by the UAVs as follows:

¹⁷⁰ *Da 'wah Institute of Nigeria & Islamic Education Trust*, 165.

¹⁷¹ Vines, P *et al.*, "Predicting Bearing Fault In The Drone Freight Industry: Legal Liability In Australia", *J. Air L. & Com.* 87 (2022): 366.

¹⁷² *Ibid.*, 364.

“Unmanned aircraft noise and emissions should be minimised as far as possible taking into account the operating conditions and various specific characteristics of individual Member States, such as the population density, where noise and emissions are of concern. In order to facilitate the societal acceptance of UAS operations, Delegated Regulation (EU) 2019/945 includes a maximum level of noise for unmanned aircraft operated close to people in the ‘open’ category. In the ‘specific’ category there is a requirement for the operator to develop guidelines for its remote pilots so that all operations are flown in a manner that minimises nuisances to people and animals.”¹⁷³

The noise test code is provided in Part 13 and Part 14 of the Delegated Regulation (EU) 2019/945. The unit to measure sound power is either by an emission sound power level (LWA) or decibel (dB). EU used the unit LWA to measure the sound power.¹⁷⁴ The discussion on the sound test and power is technical and based on the category of UAVs. The dB unit is used to scale noise and sound intensity, as it measures the relative loudness of sound by describing the ratio between two physical quantities. The louder a sound is the greater its amplitude. One decibel (0.1bel) = 10 times the power ratio's common logarithm. In contrast to Hertz (Hz), hertz (Hz) is a unit of measurement for sound vibrations and waves in one second, where one hertz equals one cycle per second. The sound level metre (SLM), the integrating sound level metre (ISLM), and the noise dosimeter are the most common methods and tools used to observe noise pollution.¹⁷⁵ It is possible to measure decibel sound from a flying UAV with a portable measuring device like the Academy of Model Aeronautics ("AMA").¹⁷⁶ Whereas the market is likely to balance most difficulties, delivery businesses will find

¹⁷³ Commission Implementing Regulation 2019 (2019/947), preamble 22.

¹⁷⁴ Delegated Regulation (EU) 2019 (2019/945), para 1, part 13.

¹⁷⁵ *Canadian Centre for Occupational Health and Safety*, “Noise-Measurement of Workplace Noise”, 30 October 2020 <https://www.ccohs.ca/oshanswers/phys_agents/noise_measurement.html#:~:text=The%20most%20common%20instruments%20used,reading%20the%20instrument%20you%20use> (accessed on February 1, 2022).

¹⁷⁶ Shbeeb, 83.

it extremely difficult, if not impossible, to keep up with the various levels of noise regulations in each locality. Another concern is that detecting the sound produced by a flying UAV will be time-consuming and tiresome. The noise level emitted by any UAV or other commercial aerial devices must not exceed the Occupational, Safety and Health Administration's (OSHA) harmful decibel threshold.¹⁷⁷

In the case of *Muehlman v. Keilman*,¹⁷⁸ the Indiana Supreme Court ruled that, depending on the circumstances, mere noise could constitute a nuisance.¹⁷⁹ In this case, the defendants' trucks were parked directly next to the plaintiff's house, close to the plaintiff's bedroom.¹⁸⁰ This case demonstrates that the nuisance suit applies to individual claims. In *Burgess v. Omahawks Radio Control Organization*,¹⁸¹ the Nebraska Supreme Court determined that the loudest of the model aeroplanes produced approximately 104 decibels at a distance of 3 feet and 84 decibels at a distance of 36 feet. The case also demonstrates that courts will not prohibit UAV deliveries based solely on the nature of the sound emitted by similar vehicles.¹⁸² UAV today's technology is far quieter in terms of sound and vibration than Burgess' model aeroplanes.¹⁸³

For example in drone delivery, in the case of *Pestey v. Cushman*,¹⁸⁴ the Connecticut Supreme Court ruled that if an injured party can demonstrate that an actor's "conduct was the proximate cause of an unreasonable interference with the plaintiff's use and enjoyment of his or her property," the party has a nuisance claim.¹⁸⁵ The court further stated that the question of reasonableness is dependent on whether the

¹⁷⁷ Shbeeb, 87.

¹⁷⁸ *Muehlman v Keilman* (Ind. 1971) 272 N.E.2d 591, 593.

¹⁷⁹ Ibid.

¹⁸⁰ Ibid.

¹⁸¹ *Burgess v Omahawks Radio Control Org* (Neb. 1985) 362 N.W.2d 27.

¹⁸² Shbeeb, 75

¹⁸³ Ibid.

¹⁸⁴ *Pestey v Cushman* (Conn. 2002) 788 A.2d 496.

¹⁸⁵ Ibid., 507.

interference is more than the plaintiff should endure without being compensated.¹⁸⁶ Pestey's case stood to safeguard private proprietors against restrictions on their enjoyment of their land.¹⁸⁷ As a result, the proprietor does not have an absolute right to use his or her property, such as the airspace right. The existence of unreasonable interference by such acts to individuals or the public is the litmus test for measuring nuisance acts. The court must consider the normal or common routine of the public and compare it to the current interference. If the interference is persistent, it may meet the definition of unreasonable interference.

According to Item 4.1.1(d)(4) of the Civil Aviation Directive 6011 (II) - Agricultural UAS Operations (CAD 6011 (II) – AGR), the responsibility and duty of the operator and holder of the licence to establish procedures to arrange the UAV operations in a way that minimises disturbances and nuisance to people and animals, including noise and other emission related disturbances. Nevertheless, the directive further notes the exemption of the provision to the private UAV licence holder, as follows:

“Note. - A private UAS AWC Holder is exempted from requirement 4.1.1(d). A private UAS AWC Holder shall follow strictly the operational procedures based on the manufacturer's recommendations, if available.”¹⁸⁸

Furthermore, Item 4.1.1(j)(2) of the CAD 6011 (II) – AGR mentions the operator must keep the environment suitable for safe operation, which includes reducing noise

¹⁸⁶ *Pestey v Cushman* (Conn. 2002) 788 A.2d 508.

¹⁸⁷ Shbeeb, 65.

¹⁸⁸ Civil Aviation Directive 6011 (II) - Agricultural UAS Operations, (CAD 6011 (II) – AGR), notes of 4.1.1 (d).

and other emissions in the defined operating area.¹⁸⁹ Due to the massive number of UAVs used in agricultural operations, there is a chance of noise pollution that could be considered a public nuisance. In addition, Item 5.1.1.1(e) provides the responsibility of the operator to establish procedures and limitations for the operation which includes as follows:-

(e) Guidelines for its remote pilots to plan UAS operations in a manner that minimises nuisances, including noise and other emissions-related nuisances, to people and animals.¹⁹⁰

It is reasonable to include this clause and make it the operator's obligation to maintain the permissible noise level. In the case of *Chin Moy Yen & Ors v Chai Weng Sing & Ors*,¹⁹¹ the Court of Appeal unanimously held that it was amply demonstrated that there was “noise” present that was beyond the threshold of what a civilised society and community could tolerate and constituted a nuisance.¹⁹² The level of noise shall be measured periodically for the UAV operation. Anyhow, there should be another requirement that must be met for the sound level of UAVs to qualify for a CAAM noise certificate, similar to the practice of manned aircraft, where the requirement of noise certificate is mentioned in the Civil Aviation Directives 1601 - Noise Certificate [CAD 1601], This is regarded as a proactive step to safeguard the public from disruption caused by commercial use of UAVs. It is suggested that the CAAM shall monitor noise level measurement during the operation of commercial UAVs every three months as per normal practice in the industry.

¹⁸⁹ Civil Aviation Directive 6011 Part (V) – Unmanned Aircraft System Special UAS Project, (CAD 6011 Part (V) – UAS SUP), item 5.1.1.9(c).

¹⁹⁰ Ibid., Item 5.1.1.1 (e).

¹⁹¹ *Chin Moy Yen & Ors v Chai Weng Sing & Ors* (2019) MLJU 693.

¹⁹² Ibid., para 80.

The determination of an unreasonable interference is predicated on a balancing of interests in which all facts must be taken into account by both parties in determining whether such an act is reasonable or otherwise. This rule has been highlighted in the Restatement (Second) of Torts, the factors that are relevant in proving nuisance case are; 1) the essence of both the interfering use and the use and enjoyment invaded; 2) the nature, extent, and length of time of the interference; 3) whether the defendant is taking all feasible precautions to prevent any superfluous interference with the plaintiff's use and enjoyment of his or her property; and 4) any other variables that the fact-finder deems relevant to the question of whether the interference is unreasonable.¹⁹³

The public and community must establish a restriction and time limits for commercial UAVs flying within the neighbourhood. If a commercial UAV operates outside of normal business hours, it may be considered a violation of the law and an unusual and unreasonable intrusion into the public's space. However, the time limit for commercial UAV flights is not fixed and must be determined based on the normal course of business in a particular region. Ordinary business hours in Malaysia, for example, are typically set from 8 a.m. to 6 p.m. If a commercial UAV operates at night or after 6 p.m., it is a nuisance. By restricting and limiting the commercial UAV's flight time, it is possible to effectively ensure that noise interference from UAV vibration does not negatively affect the public community. This is also to avoid forthcoming noise complaints from the community. Commercial UAV operation in one area shall not be implemented in a generally quiet and remote area, even if it meets most safety requirements, as it would constitute a nuisance and, according to their custom, may constitute unreasonable interferences. The test of reasonableness in nuisance would

¹⁹³ *Pestey v Cushman* (Conn. 2002) 788 A.2d 507-508.

gradually change based on the community's acceptance of the specific interference. Thus, a nuisance suit is a case-by-case scenario in which all facts, lifestyles, and customs of the individual and community around them must be considered.

4.10 SOLUTION: THE COMMON INTEREST COMMUNITY SETTING

Despite the developer's concern that the lands they own or will soon acquire for the mandatory development of a drone corridor will be encumbered by buzzing or limited development options,¹⁹⁴ another positive effect may result from it, which is the creation of a common interest community setting. If a specific area or neighbourhood is designated as a drone corridor area, the issue of nuisance will be resolved because everyone in the community acknowledges and agrees that commercial UAVs will be flying above their land. Drone-corridor is a long-term investment that is a designated flight path for commercial UAVs to ensure safe and legal operation in the airspace that consists of ceiling, side, and floor, as well as a specific altitude and spectrum of flight. Furthermore, only new development housing projects that are designated as free-UAV zones or drone corridors will be successful in this programme, as applying this to other community settings appears to be a failure. The willingness of the community to live in the drone corridor area demonstrates the concept of a common interest community setting. The drone corridor necessitates a comprehensive plan to build an artificial intelligence town, and those who live there believe they are willing to accept and consent to the unusual interference and other types of nuisances caused by commercial UAVs.

¹⁹⁴ Miller, B.M., "Drone Delivery and the Takings Clause", *Texas A&M Journal of Property Law*, 6(2), (2020): 164.

The Common Interest Community Setting (CICs) is a type of deed of mutual covenant within the community to accept and convent certain rules like pet restrictions, and the acceptance of new technology especially drone delivery in their neighbourhood with certain limitations.¹⁹⁵ Community associations are in charge of these CICs. The CICs impose restrictions on the application of declaration restrictions in the form of reasonableness limitations.¹⁹⁶ These restrictions, however, do not affect a private homeowner's ability to use nuisance claims outside of the declaration.¹⁹⁷ The initial development of the neighbourhood or community is to achieve certain requirements to achieve their covenant goals. If the community allows drone delivery to enter the neighbourhood, the proprietor automatically consents to such invasion, and the exclusion clause for trespass is enshrined in the neighbourhood's mutual covenant deed. These CICs can only be effective for new housing developments by declaring the area or neighbourhood as a UAV-free zone and subsequently allowing all community members in the neighbourhood to fly UAVs for recreational purposes or even allowing other UAVs, particularly commercial UAVs such as drone delivery, to function appropriately.

Unlike geo-fencing, which is attached to the UAV, CICs are another method or policy of the government to broaden the commercial use of UAVs within the community, particularly in new housing developments. Can one person then refuse to accept the covenant as established by the CICs? In the case of *Nahrstedt*,¹⁹⁸ a member of a CIC successfully challenged a pet ban imposed on her property.¹⁹⁹ This pet restriction essentially hindered the unit's owner from exercising her right to free use and

¹⁹⁵ Shbeeb, 66.

¹⁹⁶ Ibid.

¹⁹⁷ Ibid.

¹⁹⁸ *Nahrstedt v Lakeside Viii. Condo. Ass'n* (Cal. 1994) 878 P.2d 1275.

¹⁹⁹ Ibid., 1278.

enjoyment of her property, but the Supreme Court of California upheld it as acceptable. The court acknowledged that, even though the private homeowner did not sign the declaration, the property was subject to equitable servitude. The court emphasised that because the pet restriction was publicly recorded in the CIC's declaration, the complaining owner had access to it and thus noticed it. As a result, she was subject to the declaration because the restriction ran inequity with the land. According to the court, "the pet restriction may have been an important inducement" in deciding whether to purchase a unit.²⁰⁰ In other words, the CICs act as a collective covenant for the specific community, and all members of the community are bound to such rules and restrictions whether or not they agree to the covenant, as long as such covenant does not violate public policy or morality as a principle in contract law.

Implementing UAV-free zones in the community, which is based on CICs' collective agreement, has raised concerns about the potential harm that fallen UAVs could do to the public if the implementation is for daily usage. According to a study conducted by the FAA and numerous institutions, being struck by a falling drone is more harmful than being struck by a wooden block or steel shrapnel.²⁰¹ When comparing falling wood to falling malleable drone parts, it's more likely that a drone won't be deemed unnecessarily harmful. UAVs will also be safer and less likely to fall from the sky as a response to new technologies.²⁰² Residents have a vested interest in ensuring that falling drones do not harm them, their children, or their property.²⁰³ Persistent annoyance from UAV operations would also cause inconvenience to the community if the community did not approve of such development.

²⁰⁰ *Nahrstedt v Lakeside Viii. Condo. Ass'n*, (Cal. 1994), 1278.

²⁰¹ Vanian, J., "Here's What Happens When a Drone Falls on Your Head", *Fortune* (30 April 2017), <<http://fortune.com/2017/04/29/drone-faa-head-crash-study>> (accessed on 8 February 2022).

²⁰² Shbeeb, 74.

²⁰³ *Ibid.*, 78.

Implementing aerial drop zones or delivery pods²⁰⁴ will reduce UAV noise and light reflection while also addressing neighbour privacy concerns, all of which are common issues in municipal land use planning. These drop zones are comparable to automated manned distribution centres, as well as the Central Business District (CBD). They begin with above-ground or at-grade sorting stations made of practically indestructible material, such as recycled freight storage containers.²⁰⁵ A drop zone, more than any other feature, requires a noise buffer from nearby residential development as well as ample parking for people receiving freight.²⁰⁶ This function gives the neighbourhood a friendly UAV shipping and delivery concept rather than being concerned about property or parcel damage and nuisance interruption. The growth of UAV delivery and shipping may well be realised if drop zone features are available in every neighbourhood.

Proprietors may be compensated in a limited way for incursions on their property rights through a mechanism for issuing licences and collecting fees. Commercial UAV operators should pay communities for the avigation easement on a yearly basis. Communities may distribute permit revenue to responsible and cooperative proprietors in exchange for their renunciation of taking claims against the governments involved as well as trespass, invasion of privacy, waste, and nuisance claims against the permittees.²⁰⁷ Lower elevation layers in residential zoning districts may be more costly due to the nuisance factors of noise and view shed intrusion. Moreover, some permits in commercial zoning districts may be more exorbitant because

²⁰⁴ Hoffman, W., "Drones Will Need Air Traffic Control, Stanford and NASA Will Build It", *Inverse* (12 April 2016), <<https://www.inverse.com/innovation/spacex-data-point>> (accessed on 1 February 2022).

²⁰⁵ Widener, M.N., "Shared Spatial Regulating in Sharing Economy Districts", *46 Seton Hall L. Rev.* 111, (2015): 176-8.

²⁰⁶ *Ibid.*

²⁰⁷ Widener, M.N., "Local Regulating of Drone Activity in Lower Airspace," *Boston University Journal of Science and Technology Law*, 22(2), (2016): 259.

navigating through them may result in the loss of an alternative economic opportunity to build or lease for vertical development of a speciality nature, including such wind turbines, cellular towers, billboards, or compromise of the fee owner's marquee signing of development rights.²⁰⁸ Permit fees for commercial UAVs will vary depending on location and land use type, similar to the concept of quit rent and assessment revenue. For high-rise buildings, a drop zone is the best alternative because the UAV will hover around the drop zone rather than encroach on the unit, which would raise the legal issue of a nuisance to the neighbours who do not use the service. Under this programme, permit fees would be assessed and remittances would be distributed on an annual basis. The fee owner would be required to submit an affidavit each year attesting to fee ownership and the current zoning of the fee property, as well as a waiver of all takings, nuisance, waste, privacy invasion, and trespass claims against both the community and the UAV operators.²⁰⁹

4.11 EVALUATION AND CONCLUSION

Fragmenting the lower airspace into a synchronised regulatory arrangement may be a viable method. The infrastructure right of way in the airspace shall be identified first prior to other standard requirements in the use of commercial UAVs. The UAV shall be equipped to maintain a flying altitude between 200 feet to 400 feet so as not to encroach on the land owner's aerial right and the navigable airspace which belongs to the manned aircraft.

This is to ensure the safety of those who may be affected by the flying aircraft. The future of commercial UAVs can be realised in Malaysia if the infrastructure of the

²⁰⁸ Widener, "Local Regulating of Drone Activity in Lower Airspace", 259.

²⁰⁹ Ibid.

UAV highway or the right to use the airspace is properly managed by the relevant bodies. Although the right to use the airspace above the state land and reserved land exists in almost all State Legislations, the UAV operator is not aware of the said provisions for flying a UAV. If the state allows using of airspace to fly commercial UAVs, it may create another controversial issue that leads to the jurisdiction of State law and Federal law.

In sum, the discussion of this chapter is to suggest the navigable airspace for UAVs and to honour the specific airspace for the utilization of commercial UAVs to reduce trespass and nuisance claims. The ownership claim over the airspace is not complex if the ambiguity in law is spelt out in the legislation consequently can reduce the claim of trespass and nuisance. Because the nature of airspace is considered as *mawat* land, it is appropriate to declare the low-altitude airspace a navigable airspace that renders it federal airspace. Any matter involving aircraft, air traffic, and aerodrome comes under the jurisdiction of the Federal Government as per the Federal List of Ninth Schedule of the Federal Constitution of Malaysia. Unlike the USA, the laws and regulations of commercial UAVs and the use of airspace by UAVs are much more complex than in Malaysia as the state government, the Federal government and local authorities,²¹⁰ have the same interest in enacting the laws and regulations for UAVs because UAV laws are not centralized in the USA and would result "patchwork quilt" as the FAA could not centralize and control the airspace for the use of commercial UAV.²¹¹

In Malaysia, neither the State nor the local authorities have enacted any ordinance or regulation on the operation of UAVs. The one who is responsible for integrating the

²¹⁰ In November 2015, Chicago became the first major American city to pass UAV regulation. But the UAV Ordinance by Chicago is *pari materia* with what the FAA has enacted.

²¹¹ Ravich, 604.

laws and regulations of UAVs and determining the operation and permit to fly the UAV is the CAAM. However, if it involves the right to use the airspace, the State may come into the picture to grant the permit for the right to use the airspace. Therefore, there must be integration from the State Land Registry and CAAM in facilitating the commercial use of UAVs. Nevertheless, the existing laws in Malaysia provided alternative methods for the realisation of infrastructure right of way to UAVs.

The establishment of research development by NASA called UTM will give a bright future for commercial UAVs to fly in the airspace provided the concept of leasing of airspace, airspace highway, permit to use of airspace as well as aviation easements are fully facilitated and administered by the appropriate body. The judges shall be ready not to interpret literally the provisions regarding the ownership of airspace. The application of ownership of airspace can be arguably referred to as the wider concept of the use of airspace to fly the UAV. Where the airspace is considered as part of the land, the proprietors or the registered proprietors can further lease, sub-lease, grant a permit, or grant easement of their lands for the commercial use of UAVs. The key to a successful UAV highway is a harmonization of regulations which requires cooperation from all agencies. The introduction of UAVs in our society has dramatically increased the value of low-altitude airspace and the claim of ownership over the airspace above the surface of the land. The future of airspace legislation is questionable. Because of these uncertainties, clear law in the form of legislation may be preferable over the common law concept in relation to the right to the enjoyment of airspace. In other words, the law governing ownership and right to use the airspace was built upon conflict thus the current law fails to ensure predictable solutions to prevent such conflict. The fact that lower altitude airspace is outside the range of navigable airspace of fixed-wing

aircraft has already given a conflict in the right of passage and right to use of low altitude airspace by the commercial UAV.

The reasonableness in assessing aerial trespass is a subjective approach that varies from case to case. Once the CAAM has officially validated the navigable altitude for UAVs, the state and municipal governments may line up the airspace that constitutes an aerial trespass for the protection of proprietors' rights and enjoyment of their airspace. Until now, to avoid the floodgate issue of aerial trespass, the UAV operator must follow the current rules and regulations as outlined in the CAAM's VLOS and BVLOS flight guidelines. Only a few types of UAVs require BVLOS flight, yet this form of flight may result in trespass. For example, for the shipment and delivery of UAV to be efficient, the flight must be extended outside the line of sight, but the operator must monitor the flight closely from the land within the authorised distance for safety and evading trespass issues.

Commercial UAV use, when integrated regionally, will provide zero emissions, and reduce air pollution by reducing the use of motorcars in delivery services. This will minimise congestion on the highways, which are all mostly associated with the issue of nuisance and disturbance. Many proprietors will participate in such a permit programme because they are unable or unwilling to fund the cost of suing the trespassers and the creator of the nuisance.

Those on the right side of the spectrum should be aware that as more manufacturers enter the UAV business, competition and impetus toward products will increase. In a nutshell, more opportunities in the commercial UAV industry will contribute to the community's technological advancement. Many owners will participate in such a permit programme because many communities are unable or reluctant to pay the expenses for legal suits for trespass and nuisance, and by providing

a waiver in the permit, they will gain profitable income while the community benefits from the technology. Figure 4.3 describes the summary of this chapter on methods for acquiring UAV airspace as follows:

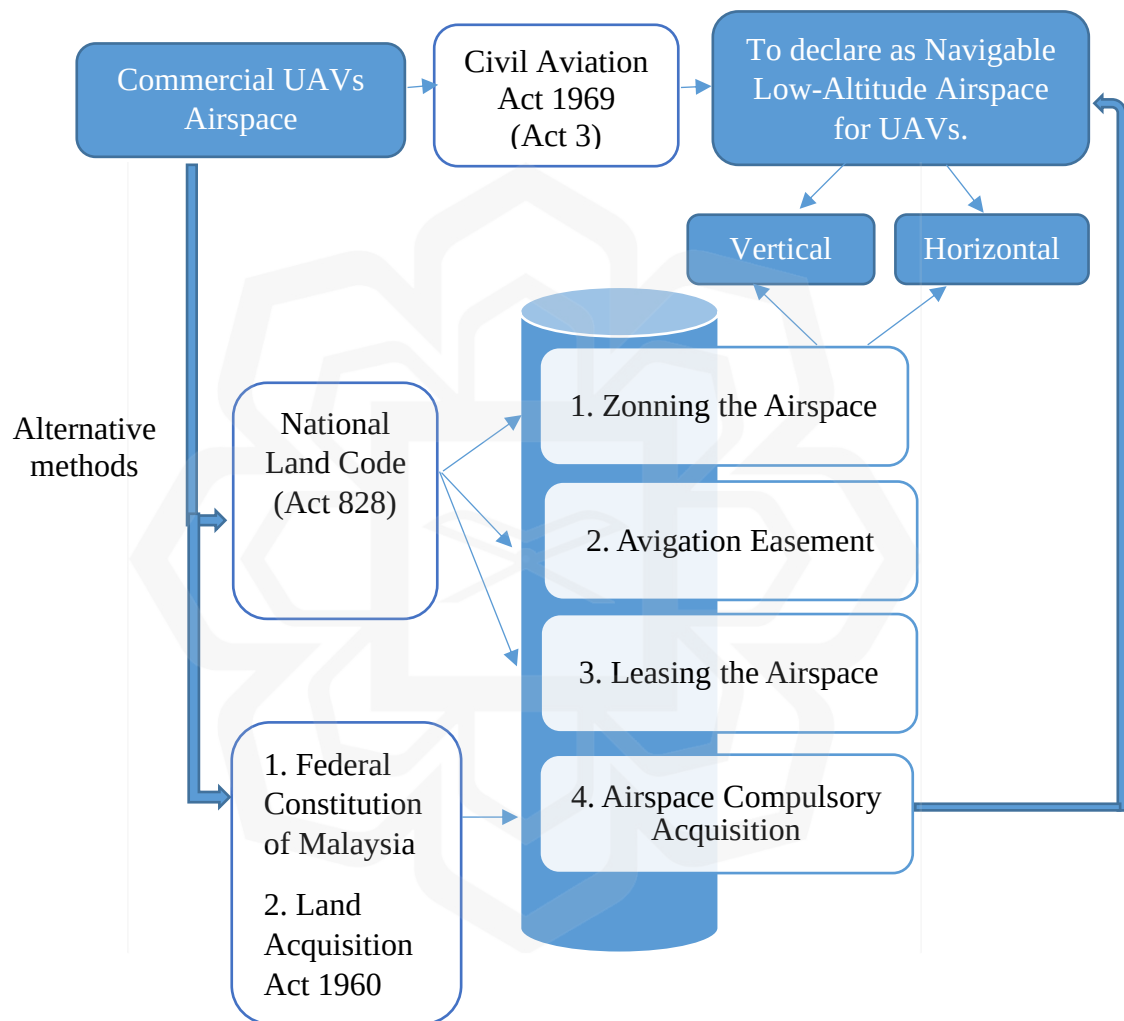


Figure 4.3 Methods to Acquire the Commercial Use of UAVs Airspace.

CHAPTER 5

THE DUTIES AND LIABILITIES OF THE COMMERCIAL UAVs IN MALAYSIA

5.1 INTRODUCTION

This chapter evaluates the duties and liabilities of the main parties to commercial UAVs which are the operator, the owner and the manufacturer. The main concern of this chapter is to examine the liabilities of those parties against the liabilities towards the public, a person on the grounds and property. The competency of an operator or a pilot in handling UAVs is essential to build the confidence of the public due to the nature of the UAV as a flying object. Thus, an operator of UAVs shall possess not only theoretical knowledge but also practical knowledge of the UAVs. Moreover, the requirement of airworthiness of the commercial UAV also is vital for the application for a permit as each commercial UAV has a different risk assessment, especially in terms of the payload of the UAVs.

Furthermore, the concept of strict liability and breach of warranty also are evaluated in this chapter to see to what extent the liabilities of the operator and the manufacturer towards any tortious action in general. Whether the nature of commercial UAVs can be regarded as a dangerous activity which comes under the limbs of strict liability? In addition, this chapter discusses the risk assessment and the measurement of foreseeability of risk based on the types of UAVs, which are; 1. The low risk or open category, 2. The medium risk or specific category, and 3. The high-risk or certified

category. Lastly, this chapter analyses the possible solutions for commercial UAVs to mitigate the risks by offering insurance law, policing and monitoring and registration of UAVs. Therefore, by having those solutions commercial UAVs can be accepted and grow in Malaysian society.

5.2. THE COMPETENCY OF THE OPERATOR OF COMMERCIAL UAVS

The operators and pilots regardless of the type of UAV are required to have extensive knowledge of handling the UAV, maintenance of UAV, components of UAV, knowledge of take-off and landing, safety procedures, and even meteorology and geographical topology which make them competent to fly the UAVs. The analogy of a licence for UAV operation is simple because it constitutes a type of vehicle, thus just imagine UAV is similar to other types of vehicles in that the driver is required to have a licence approved by the Road Transport Department. A similar procedure also is required for the registration of vehicles. Each law and regulation in every country on the commercial use of UAVs differs in listing the requirements for commercial use of UAVs. Thus, certain guidelines in flying commercial use of UAVs are necessary for the safety of the public despite their demand in the market. The operator as well as the owner shall ensure that their UAV and themselves are ready, eligible, and fit to fly the commercial UAV. Similar requirements and approaches may be imposed on commercial aircraft towards the pilot and the aircraft before the aircraft is eligible to fly for commercial purposes. The operator of commercial use of UAV shall have the certificate of competency to ensure the operator is knowledgeable in handling the UAV for commercial use. This requirement is considered essential for the safety of the public because the end product of commercial UAVs is usually individual public.

For example, in Canada, before launching a UAV the operators ought to get a Special Flight Operations Certificate (SFOC) from Transport Canada. The SFOC application process and complexity vary depending on the proposed operation's nature, but it usually necessitates, the law provides as follows:

“The applicant's name and contact information; the person in charge of the operation's address; how the operator may be contacted immediately during the operation; the operation's nature and purpose; a detailed summary of all relevant flight data for the aircraft being flown; the proposed operation's dates, alternate dates, and timings; emergency contingency plan dealing with any disasters resulting from the operation; security plan for the area(s) of operation and to be overflowed to ensure no hazard is caused to individuals or properties on the surface; if not the operator, the name of the person in charge of the operation's supervision; comprehensive plan explaining how the operation will be carried out, including details such as altitudes and routes used; the applicant's insurance coverage; and any other information relevant to the operation's safe-conduct requested by Transport Canada.”¹

The strict requirements imposed by the Canadian authorities can be implemented in Malaysia since they provide comprehensive and detailed protections for the operation from pre-launch to post-launch. UAVs are also subject to and under the control of the Ministry of Transport. The Ministry of Transport's portfolio, with the assistance of CAAM, can be expanded to UAVs to provide public confidence and a comprehensive safeguard to the public, particularly in terms of the legitimacy of the licencing and permit to fly commercial UAVs. This demonstrates the licence holder's responsibility to fly the UAVs safely and to avoid hazards with the prudence of negligent behaviour.

Moreover, in Singapore, the Unmanned Aircraft (Public Safety and Security) Act of 2015 dictated that the operation of UAVs for commercial purposes shall obtain two

¹ Canada Transportation Act 1966, S.C.

different permits; 1) the Operator Permit and 2) the Operation Permit irrespective of its weight. The Civil Aviation Authority of Singapore (CAAS) grants the Operator Permit, which is a permit-granting apparatus meant to ensure that experienced and qualified operators satisfy the highest safety standards.² The Operating Permit, conversely, requires the applicant to demonstrate the applicant's organizational set-up, level of competence of the personnel, particularly those flying the unmanned aircraft, safety protocols, including conducting safety evaluations, and the airworthiness of each of the aircraft.³

The unmanned aircraft remote pilot certification is mentioned in subpart C of Rwanda Civil Aviation Regulations (Part 27 Unmanned Aircraft Systems) 2019, where this part applies to airmen certification for civil UAVs under the specific categorization.⁴ Further, eligibility for a remote pilot licence or certificate under Rwanda regulation is mentioned under Part 27.165 (a) where the RCAA may issue a remote pilot licence or certificate to the applicant aged above 18 years old and has passed certain requirements as approved by the RCAA:-, (1) an aeronautical knowledge examination within the meaning of the specified knowledge level in this regulation; or (2) an aviation licence theory examination taken to be an equivalent requirement for the issuance of a remote pilot licence/certificate; or (3) the theory component of a remote pilot training course; or (4) the theory component of a course conducted in a foreign country which the Authority is satisfied is equivalent to the theory component of a remote pilot training course.⁵ The RCAA provides leniency in obtaining a remote pilot

² Chen, G.Y., "Reforming the Current Regulatory Framework for Commercial Drones: Retaining American Businesses' Competitive Advantage in the Global Economy", *Northwestern Journal of International Law & Business*, 37(3), (2017): 534.

³ Ibid.

⁴ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), reg 27.160.

⁵ Ibid.

licence for the operators or pilots, even a training course in UAV is also accepted for the licence. Further Part 27.190⁶ extend the requirement of UAV certification and licence for commercial purposes. RCAA acknowledges UAVs for commercial purposes will undergo certain modifications to suit the objective of the UAV, thus only approved modifications by RCAA can fly UAVs under this category.

In Australia, the operator of a UAV must acquire certain qualifications for instance to complete certain hours of a training program and flying hour experience also is essential to count and to grant a permit to fly the UAV. On the other hand, in France, a certificate of theoretical competence for flying a manned aircraft is considered a requirement for the commercial use of UAVs. The operator at least completes a certain training course for the commercial use of UAVs. Thus, having a manned aircraft pilot's license is an advantage in granting another permit to fly a commercial UAV. In Germany, the operator is required to provide certain information on the operator's knowledge and experience, or proof of training before flying a UAV weighted between 5 kilograms to 25 kilograms. In Israel, besides information on the citizenship of the operator, and place of business, other additional pieces of information shall also be produced for licensing of commercial use of UAV, especially possession and ownership of the UAV and necessary equipment attached for its operation, and authorization for flying and landing in designated areas in Israel. Another strict requirement in Israel for flight licenses will be issued with the calculation of the number of take-offs and landings in the previous flight within ninety days preceding the flight, however, it depends on the type of flight. The type of licenses issued will be determined by the operator's qualifications, such as trainee, UA subject to VLOS flyer, UAS flyer, and UAS

⁶ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), Subpart D.

instructor; the type of flight (domestic, external, experimental); and the UAS type, grade, and class.⁷ Moreover, in New Zealand, any operator of a UAV with a weight of more than 25 kilograms or any operation outside of the general limitation is required to have knowledge and skills of flying UAV by completing certain training and other relevant documents that indicate experience as an operator of UAV.

In Poland, the operator of the commercial use of UAVs shall have a certificate of competency from the Polish Civil Aviation Authority. This requirement is parred value as manned aircraft pilots. The operator must pass a medical check-up, theoretical and practical tests, and have insurance. These similar requirements are imposed on UAVs like other motor vehicles. The applicant must sign a declaration of knowledge of applicable regulations and basic theory (airspace, emergencies, flight rules, etc.) and pass theoretical and practical tests administered by a CAA examiner to obtain a VLOS service certificate. On the other hand, a certificate of competency for BVLOS operation allows a pilot to fly beyond VLOS and requires the applicant to pursue training courses as well as pass theoretical and practical examinations.⁸ The UAV practical assessment and radiotelephony examination, as well as an English language proficiency test, are other conditions for granting the license of UAV in South Africa.

Other than that, the operator also needs to undergo medical approval for fit to fly the UAV for every take-off session, especially the eyesight test. This is related to the rule of visual line sight in flying the UAV which requires the operator can see its UAV while flying the UAV. The operator shall fit in physically and mentally to ensure that the operator can use his/her cognitive skills in evaluating the danger and safety of the

⁷ Levush, R., "Regulation of Drone: Comparative Summary", *The Law Library of Congress*, (2016).

⁸ Ibid.

public. Apart from that, authorization or approval to fly,⁹ the commercial use of a UAV also shall be granted by the employer, the principal, or the owner of the UAV depending on the transaction that the operator enters into. South Africa and Poland require medical check-ups for the operator to obtain a license to fly a UAV, especially for commercial purposes.

In Malaysia, the Civil Aviation Directives 6011 (I) – Remote Pilot Training Organisation (CAD 6011 (I) – RPTO) which came into force on 1st March 2021 revokes AIC 04/2008 Unmanned Aerial Vehicle (UAV) Operations in Malaysian Airspace. This directive is set as a guideline to all Remote Pilot Training Organisations seeking to become Approved Training Organisations by CAAM.¹⁰ It also contains the requirements for the training and theoretical knowledge instruction and flight instruction and assessment concerning the competency of remote operators or pilots of UAVs.¹¹ The directive also pledges that once this directive is effective then the operation of UAVs will become a centric and risk-based assessment by following three types of UAVs namely open, specific and certified. For the open category of UAVs, the operator or pilot shall pass the CAAM's Unmanned and Model Aircraft Registration and Education Scheme online test. While for the specific and certified category of UAV, the operator or pilot must undergo further requirements and compliance that include prescriptive details of the level of the remote pilot competency.¹²

Furthermore, the CAAM remote pilot competency scheme consists of two (2) certificates 1) A2 Remote Pilot Certificate of Competency (A2 RCoC) which is a

⁹ *Drone Laws for A Safer Airspace*, "Drone Laws in South Africa", (6 July 2023), <<https://drone-laws.com/drone-laws-in-south-africa/>> (accessed on 26 August 2023).

¹⁰ Civil Aviation Directives 6011 (I) – Remote Pilot Training Organisation, (CAD 6011 (I) – RPTO), r 1.2.1.

¹¹ CAD 6011 (I) – RPTO, r 1.4.2.

¹² *Ibid.*, r 1.4.4.1.

theoretical examination meant for the open category of UAVs; 2) Remote Pilot Certificate of Competency (RCoC) which is both theoretical and practical flight test. Figure 5.1 provides the types of remote pilot certificates as follows:

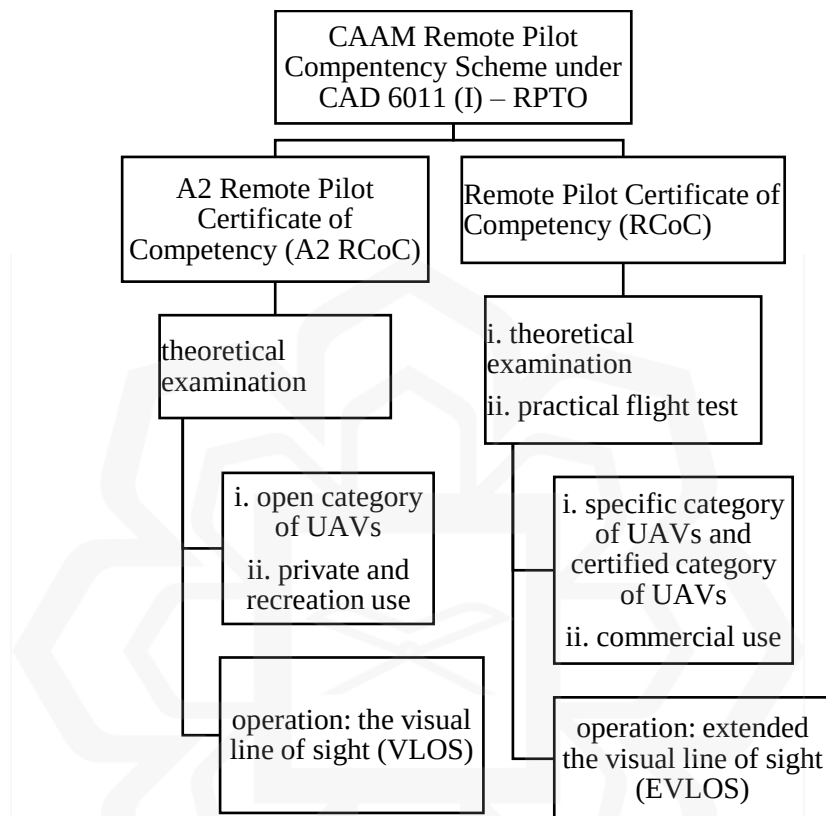


Figure 5.1 Types of Remote Pilot Certificates.

Moreover, the operator or pilot of the commercial UAV especially in agriculture UAV which is usually within the category of specific UAV shall have a further requirement as per CAAM's directive to have the RCoC-B that involves VLOS flights.¹³ For some reason, the only commercial UAV that has been approved by CAAM with the specific requirement of remote training operations is the UAV for agriculture. This is considered great news and the first step toward the development and recognition

¹³ CAD 6011 (I) – RPTO, r 1.4.7.

of commercial UAVs in Malaysia. The training course for RCoC shall be completed within the following timeline: 1) the Theoretical knowledge training phase is eight months, and 2) the Practical skill training phase is four months.¹⁴ The competency and skills of the operator or pilot of UAVs are considered adequate as per the length of the theoretical and practical course which has been held by the competent organization that is approved by the CAAM. The course also is further divided into VLOS flights which are typically for private and recreational use and EVLOS flights which are designed for the commercial use of UAVs. Indeed, on January 10, 2022, the CAAM approved curricula in relation to competency remote pilot to Air Asia Group Berhad as the sole institution to undertake the training course that includes Module 1 of EVLOS.¹⁵ The aforementioned approval is a form of mandate from CAAM to recognise the expansion of commercial UAVs in Malaysia, particularly in the delivery and shipping industries. The UAVs for delivery and shipping typically necessitate greater distance and visual sight flight than other types of operations that mimic manned aircraft.

5.2.1 Airworthiness of UAVs

Airworthiness refers to the components of the UAVs that shall fit the requirement to fly with the specific functionality as set by the laws. Airworthiness is considered a well-accepted policy for both manned as well as unmanned aircraft in the aviation sector where UAV operations, whether in the air or on the ground, shall not pose or create a massive risk to people, property, vehicles, or vessels. When conducting the same sort of operation in the same airspace, UAVs flying in Malaysia must meet at least similar

¹⁴ CAD 6011 (I) – RPTO, r 4.4.2.

¹⁵ *Civil Aviation Authority Malaysia*, “CAAM Certifies the First Remote Pilot Training Organisation in Malaysia”, (10 January 2022), <<https://www.caam.gov.my/wp-content/uploads/2022/01/Press-Release-CAAM-Certifies-First-Remote-Pilot-Training-Organisation-in-Malaysia.pdf>> (accessed on 17 January 2022).

safety and operational standards as manned aircraft.¹⁶ The requirement for civil aircraft Certificates of Airworthiness shall be applied *mutatis mutandis* to UAVs per the international compliance and standard established by Annex 8.¹⁷ The requirement of Annex 8 states that the State of Design must provide proof of an approved type design by issuing a Type Certificate; that an aircraft be manufactured in a controlled manner to ensure compliance to the approved type design; that the State of Registry issue a Certificate of Airworthiness relying on satisfactory evidence; that the aircraft meets the appropriate airworthiness requirements in terms of design; and that the State of Design, the State of Registry, and the type certificate holder work to ensure the aircraft's continued airworthiness.¹⁸ In ICAO Circular 328-AN/190, rule 6.10 states that all aircraft, whether manned or unmanned, must have a high degree of commonality in terms of airworthiness. In Australia, the Civil Aviation Safety Authority (CASA) has yet to adopt a complete set of airworthiness standards for the UAV industry. At the moment, only big UAVs weighing more than 150 kilogrammes are required to receive an airworthiness certificate. This means that the high-risk UAV must acquire an airworthiness certificate. However, this arrangement will nullify the entire legal process because the airworthiness of the UAV is critical in determining the standard of care, liability, and even strict liability. As a result, irrespective of weight, the criterion of airworthiness must be made mandatory for all forms of UAV operations.

In contrast, the airworthiness assessment of UAVs is expected to change as technology advances, particularly in commercial UAVs that must be modified to match the operation's needs. The airworthiness compliance for UAV agriculture would not be the same as the airworthiness compliance for UAVs used in shipping and delivery or

¹⁶ CAD 6011 (I) – RPTO, r 1.6.1.

¹⁷ Convention on International Civil Aviation 1944 (Chicago Convention) (UN), art 33.

¹⁸ ICAO Circular 328-AN/190, r 6.14:27.

for aerial work. The contribution of airworthiness to the total safety case will either be to a set standard established by the law, or it will be changeable depending on the types of operation of the UAV. The ability of a UAV to be modified to meet operational needs is a significant distinction from manned aircraft, therefore airworthiness requirements will not be applied in the same way.

The objective of operating commercial UAVs, which are either remotely controlled or pre-programmed, would be defeated if the application of airworthiness were limited to following manned aircraft. Urgent changes are required to instruct ICAO to give a comprehensive assessment of the airworthiness of UAVs in accordance with UAV operation. Commercial UAV operations span a wide range of economic sectors, making it impossible to single out one for emphasis in terms of airworthiness compliance. There are various variations among UAVs in terms of payloads, modes of operation, and weight, all of which have an impact on their compliance with airworthiness regulations.

Thus, in Canada, the certificate of airworthiness is required depending on the type and the purpose of the UAV which is either for recreation use or non-recreation use; and the weight of the UAV. The pilot who flies the commercial use of UAV which falls under the category of non-recreation use is required to supply the certificate of airworthiness. A certificate is also required for the operation of UAVs for non-recreational purposes or for UAVs that weigh more than 35 kg (regardless of the purpose). South Africa has classified UAVs into two categories; Class 1 and Class 2 and further divided into another subclass; private use, commercial use, and corporate and non-profit operation. Only private operations are exempted from various requirements pertinent to other operations, comprising the letter of approval to fly, certification of registration, and UAV operator certificate.

In Malaysia, UAV permits, licences, and certificates of operation must be obtained through the CAAM per Rule 189.¹⁹ Airworthiness certification is currently required for all commercial UAVs, based on the types of UAVs recognised by the CAAM: open, specific, and certified. Most of the commercial UAVs in Malaysia are listed under the specific category of UAV due to the different functionality and operation of UAVs in the commercial sector. Apart from that further certification and testing under SIRIM for the UAV is also essential in the conformity of granting the permit for operation under the CAAM. The certification and testing under SIRIM are categorized into two namely; 1) Compliance Approval (Testing Approval) and 2) Special Approval. The Compliance Approval testing or Testing Approval is awarded to the specific model or established brand. This kind of approval is meant for local sale and only granted to the Malaysian Registered Company including the Importer, the Manufacturer or the Supplier. Special Approval on the other hand is an exclusive approval to an individual or company. It is awarded to the specific or established brand or model for its usage, exhibition or UAV that is still under research and development (R&D), demo and training or market survey. The testing and certification under SIRIM are comprehensive and include the components of the UAV, radiofrequency and special technical parameters of the approved UAV set by the MCMC. Commercial UAVs undergoing special modifications must also obtain SIRIM certification for testing the compatibility and safety issues. The SIRIM certification and accreditation could be an appropriate standard for approving the airworthiness of commercial UAVs. Whatever method of testing the airworthiness of the commercial UAV, as of now the standard as per Annex 8 of the Chicago Convention must be adhered to for compliance with the

¹⁹ Civil Aviation Regulations 2016 [P.U.A 97], r 143(2).

international standard in the aviation industry. It is up to the Member States to determine how to recognise the testing in terms of the UAV's airworthiness.

5.2.2 Accident and Negligence

UAVs have caused a few unreported accidents, but more will come. An accident is often referred to as careless behaviour that results in the establishment of the tort of negligence. Accidents either cause personal injury or property damage. Tort law holds everyone who owes a duty to another person liable when that duty is breached and causes injury or damage to that person. UAV's performance in the actual world is by its very nature unpredictable and uncertain. Accidents and negligence are linked when carelessness occurs as a result of a lack of sufficient care and attention. Negligence is a comprehensive right of recourse for injury produced by a failure to exercise reasonable care when a person owes a duty of care to someone who may be harmed by the first person's conduct or omission. It is important to determine the hazard and risk accordingly based on the operation of the UAV. Almost all UAVs include algorithms that enable them to do emergency manoeuvres on their own. Autonomous hover, quick landing, and return to home are the most prevalent and can be found on almost any small UAV on the market.²⁰

By adopting the neighbourhood principle established in the case of *Donoghue (or McAlister) v Stevenson*,²¹ an operator or pilot of UAVs owes a duty of care to everyone who is in close proximity to and within the vicinity of the operation of UAVs. If the operation is within 5 kilometres, everyone along the route is their neighbour, and

²⁰ Perritt, H, "Who Pays When Drones Crash?" *UCLA Journal of Law and Technology*, 21(1), (2017): 9.

²¹ *Donoghue (or McAlister) v Stevenson* [1932] All ER Rep 1.

so the duty arises. This duty, however, must be proven in court using the reasonable man test. When the duty of care arises, the operator or pilot of the UAV should take special precautions to avoid injury or damage to the affected person or property. As a result, they must adhere to the usual standard of care as a UAV operator or pilot. They have most likely breached their duty if they act below the minimum standard of care. Furthermore, in the case of *ACQ v Cook; Aircair Moree v Cook; Cook v Country Energy; and Country Energy v Cook*,²² the New South Wales Court of Appeal opined that the pilot may have owed a duty to people on the ground who might have been injured if the plane or anything dropped from it struck them or caused them to sustain injuries while taking evasive action.²³

The standard of care can be viewed as an apparatus for calculating the possibility of injury and damage. As a result, the CAAM directives' standard operation and procedure shall serve as a yardstick for the level of care. If the operator or pilot of the UAVs adheres to all of the directive's standard requirements, this can be evidence that they comply with at least the minimum standard of care and hence are not in breach of duty. The ability of an operator to handle UAVs is also evaluated as part of the standard of care. The UAV pilot must discharge their duties with a reasonable level of skill and expertise as a professional UAV pilot. The feature of UAV 'return to home' is a universal standard of care for the airworthiness of the UAVs. If the UAV is unable to have this feature, it is conclusive that the operator or pilot is in breach of duty if they continue to use the defective or non-airworthiness UAV. A drone malfunction that results in a crash could cause property damage, devastation of natural habitats, and

²² *ACQ v Cook; Aircair Moree v Cook; Cook v Country Energy; Country Energy v Cook* [2008] NSWCA 161, 337.

²³ *Ibid.*, 337.

injury or death to people, especially in densely populated places. One promising technique to avoid such injury is to employ structural condition monitoring technologies to detect any degradation in a drone's airworthiness.²⁴

A further essential aspect of proving negligence is damage. In proving the damage, the plaintiff must prove that there is establishing a causal link between the breach of duty and the damage or injury. In tort of negligence usually, the damage can be seen either as 1) personal injury or death; and 2) property damage. Personal injury can be seen in terms of physical injury which can be permanent and temporary or emotional injury. This type of injury will be calculated from all aspects including the future loss. Meanwhile, the property damage is often calculated based on the actual value of the property at the time of destruction. It is easy to prove this element if there is a single link connected to the damage or injury. If a UAV fell and hurt someone and there was no other conceivable cause for the accident, the negligence claim would most certainly be successful.

5.2.3 The strict liability (no-fault liability) of the operator

The activity of flying a UAV whether it falls under private or commercial use shall be categorised as an abnormally dangerous activity that falls under the principle of strict liability. Therefore, in the case of negligence, it is an absolute law that the defendant would be liable for negligence and injuries suffered by the plaintiff resulting from the flying UAV without proving the elements of negligence at all. Nevertheless, if UAVs become more ubiquitous in society, the classification is less likely to be abnormally dangerous, and the principle of strict liability would not be applied. The plaintiff must

²⁴ Vines, P *et al.*, "Predicting Bearing Fault in The Drone Freight Industry: Legal Liability in Australia", *J. Air L. & Com.* 87 (2022):299.

establish injury and causation, regardless of the level of care used in carrying out the activity. Based on section 520 of the Restatement of Torts, mentions the abnormally dangerous activity as follows:-

“In determining whether an activity is abnormally dangerous, the following factors are to be considered:

- (a) existence of a high degree of risk of some harm to the person, land or chattels of others;
- (b) likelihood that the harm that results from it will be great;
- (c) inability to eliminate the risk by the exercise of reasonable care;
- (d) extent to which the activity is not a matter of common usage;
- (e) inappropriateness of the activity to the place where it is carried on; and
- (f) extent to which its value to the community is outweighed by its dangerous attributes.”²⁵

Flying objects in the airspace right over our head is considered a dangerous activity in nature as if it falls, it will fall over our head and may result in grievous injuries to the head or even worse to the brain. Thus, it is the absolute duty of the operator to take reasonable care to cause injury to the public. The pilot and operator of the UAV especially the commercial UAV shall assess all risks that are contingent on the specified purpose of flying the UAV. They are bound to follow strict procedures laid down by the CAAM before, during, and after the take-off and landing of the UAV. Since the case of *Guille v. Swan*,²⁶ the principle of strict liability *vis-à-vis* injuries caused by aircraft to persons and things on land was reformulated if direct damage to land or personnel or property on the ground is caused by an aircraft's ascent, descent, or flight, or by the dumping or falling of an object from the aircraft, (a) the operator of the aircraft is liable for the harm, even if he took all reasonable precautions to avoid it; and (b) the owner of

²⁵ Restatement (Second) Of Torts (Am. Law Inst. 1979), s 520.

²⁶ *Guille v Swan* (N.Y. Sup. Ct. 1822)19 Johns 381.

the aircraft is liable for the damage if he has authorised it.²⁷ Further, Restatement (Second) Of Torts section 520A (1977) provides a provision on ground damage from aircraft in the context of negligence and strict liability. Moreover, in the case of *Rochester Gas & Elec. Corp. v. Dunlop*,²⁸ used the principle of strict liability for tortious acts caused by aircraft crashes. However, in the case of *Crist v. Civil Air Patrol*,²⁹ the court was reluctant and declined the application of strict liability or principle of *res ipsa loquitur* in non-appearance of intention to crash aircraft.

The court shall be ready to extend further this strict liability in dealing with injuries caused by agents, employees, subcontractors, and independent contractors as the concept of this strict liability will be coupled with the rule of vicarious liability and the existence of other commercial agreements. If commercial UAVs fly under the assignment and agreement of employment, thus the principle of vicarious liability will come out into the picture to solve the strict liability issue. Generally, the employer will be held liable for negligence caused by his employee. If the operator of a commercial UAV has caused injuries to any public or has flown negligently over people, thus the employer will be liable for strict liability caused by his employees. This is a clear rule if the operator or pilot of a commercial UAV is the employee of the owner company which regards him as the employer. The concept of vicarious liability also must be able to distinguish between the contract of service and the service contract. Thus, the contract for service entered by an independent contractor is excluded under this rule. Therefore, an operator that offers services to fly a UAV for a specified purpose in a short period and regards himself as a freelancer or an independent UAV operator shall equip the

²⁷ *Guille v Swan* (1822) 19 Johns 383.

²⁸ *Rochester Gas & Elec. Corp. v Dunlop* (N.Y. Co. Ct. 1933) 266 N.Y.S 469.

²⁹ *Crist v Civil Air Patrol* (N.Y. App. Div. 1967) 278 N.Y.S.2d 434.

UAV for all possible risks and shall keep a high standard in avoiding possible risks and tortious liability from the flying UAV.

5.2.4 Vicarious Liability in UAVs

The fact that commercial use of UAVs will capture the economy gives new job opportunities to Malaysia. The relationship existing between the owner of UAVs as an employer and the operator of UAVs as an employee will emerge in Malaysia circle. The rule that an employer is vicariously liable for the tortious act of the employee is widely applied in common law rule. It is crucial to review who constitutes an employee which subject to this doctrine of vicarious liability. In Malaysia, the employee is interpreted in section 2 of the Employment Act 1955 which directs to the classes of the employee in the first schedule of the Act which is summarized as follows:

- “1. Employees who enter a contract of service with wages does not exceed RM2,000 per month;
- 2. Employees who enter a contract of service with an employer irrespective amount of wages in respect of the following:-
 - (1) engage in the manual labour
 - (2) engaged in the operation or maintenance of any mechanically propelled vehicle operated.
 - (3) who supervises or oversees other employees engaged in manual labour
 - (4) engaged in any capacity in any vessel registered in Malaysia; and
 - (5) engaged as a domestic employee.”³⁰

The Employment Act of 1950 serves as a yardstick in determining the existence of a master-servant relationship. Further, the contract of service is interpreted as any arrangement, whether oral or written, express or implied, by which one person agrees

³⁰ Employment Act 1955 (Act 265), first schedule.

to engage another as an employee and the other agrees to serve his employer as an employee, including an apprenticeship contract.³¹

In the case of *GMP Kaisar Security (M) Sdn Bhd v Mohamad Amirul Amin bin Mohamed Amir*,³² the Federal Court observed in light of the issue of vicarious liability as follows:-

“The scope of vicarious liability in a case where the employee committed an intentional wrong is underpinned by the following common denominators:

- (a) the intentional wrong must be committed by the employee in the course of employment;
- (b) there must be connection between the wrongful act and the nature of the employment;
- (c) the nature of the employment is such that the public at large is exposed to the risk of physical or proprietary harm; and
- (d) the risk is created by the employer, owing to the features of the business.”³³

If the aforementioned criteria are met, the employer owner of the UAV might be held vicariously liable for the accident caused by his employee operator. There must be a link between the plaintiff's injuries or damage and the operation of UAVs to hold the employer and owner jointly accountable for such an act. Furthermore, in the Australian case of *Deatons Proprietary Ltd v Flew*,³⁴ the court accepted the test that an employee acting deliberately or negligently within the scope of authority holds the employer liable. Nolan suggested that vicarious liability is divided into two major issues as follows:

“Stage 1. was the relationship between the tortfeasor and the defendant one capable of giving rise to such liability; and

³¹ Employment Act 1955, s 2.

³² *GMP Kaisar Security (M) Sdn Bhd v Mohamad Amirul Amin bin Mohamed Amir* [2022] 6 MLJ 383.

³³ Ibid.

³⁴ *Deatons Proprietary Ltd v Flew* (1949) 79 CLR 376.

Stage 2. was there a close enough link between the tortious conduct and that relationship for such liability to arise on the facts.”³⁵

This tort concept applies to acts committed by employees while acting in the course of their job for which they are jointly liable with their tortfeasor employer (particularly private employers).³⁶ This principle does not apply to the employee individually. The idea of vicarious liability may be invoked in the event that an accident occurs while UAVs are in operation unless there is a relationship between the operator employee and the owner of the UAV employer.

Additionally, the independent contractor is also excluded from this rule because their relationship with the UAV owner master is established in accordance with the contract for service. Contractor is defined in section 2 of the Employment Act 1950 as follows:

“contractor means any person who contracts with a principal to carry out the whole or any part of any work undertaken by the principal in the course of or for the purposes of the principal’s trade or business.”

This distinction is critical in determining contract obligations for business enterprises operating UAVs. The independent contractor works for himself and receives wages for the work that he is hired to do. This is a regular interaction in the commercial UAV market, where a few UAV operators are professionals at flying UAVs independently and have been paid to fly UAVs for the given purpose. There is no shifted culpability, unlike the vicarious liability principle, therefore the independent contractor is personally liable for the torts.

³⁵ Nolan, D., “Comparing Vicarious Liability”, *Jotwell: The Journal of Things We Like (Lots)*, (3), (2023): 1.

³⁶ Harris, K.K., “Drones: Proposed Standards of Liability”, *Santa Clara High Technology Law Journal*, 35(1), (2018): 72.

5.2.5 Liability of operator agent in the commercial use of UAVs

However, the rule of vicarious liability will not be applied to the commercial UAV which is under the assignment of the agency contract. As the principal is not liable for an agent's tortious actions. The agent is personally liable for the tortious conduct committed by him. However, if the principal and agent are acting in a master-servant capacity, then the master is vicariously liable for the servant agent's torts conduct. The agent here is stretched to the electronic agent which includes the UAV itself. Typically, an agency agreement is a three-party agreement between the owner, the principal, and the third party. The idea of agency is growing in popularity in the UAV agricultural sector, where the UAV operator acts as the principal owner's agent to give services to other farmers. Although the principal owner of the UAVs pays the commission, this does not arrange a relationship between an employer and an employee. The law of agency is governed by the Contracts Act of 1950. Section 135 of the Contract Acts 1950 defines agent and principal as follows:

“An “agent” is a person employed to do any act for another or to represent another in dealings with third persons. The person for whom such act is done, or who is so represented, is called the “principal”.”³⁷

The liability involved in the agency is on a contractual basis. All the terms and the agreement of the contract shall specify the extent of duties and liabilities of the operator who acted as an agent for the principal owner of the UAV. The extent of liability of an agent is limited to the authority to do every lawful thing which is

³⁷ Contracts Act 1950 (Act 136), s 135.

necessary in order to do the act.³⁸ It connotes the agent cannot act in *ultra vires* with the authority given by the principal. However, if necessary to act beyond the scope of the apparent authority, an agent can do so if such action is lawful or usually done in the course of conducting such business.³⁹ Furthermore, in case of emergency, an agent has a duty as mentioned in the Act as follows:

“An agent has authority, in an emergency, to do all such acts for the purpose of protecting his principal from loss as would be done by a person of ordinary prudence, in his own case, under similar circumstances.”⁴⁰

The choice of whether to protect the principal from loss or to safeguard the public or property from harm caused by the operation of UAVs is critical in the context of UAV operation. Emergencies should be evaluated on a case-by-case basis. The issue of skills and expertise in the agency contract is mentioned under section 165 of the Contracts Act 1950 which reads as follows:

“An agent is bound to conduct the business of the agency with as much skill as is generally possessed by persons engaged in similar business, unless the principal has notice of his want of skill. The agent is always bound to act with reasonable diligence, and to use such skill as he possesses; and to make compensation to his principal in respect of the direct consequences of his own neglect, want of skill, or misconduct, but not in respect of loss or damage which are indirectly or remotely caused by such neglect, want of skill, or misconduct.”⁴¹

If the agency contract requires the operator agent to have specified skills to handle UAVs, the law presumes that the agent is compelled to behave in line with the specific skills, unless the principal requests otherwise. Failure to act in accordance with section

³⁸ Contracts Act 1950, s 141(1).

³⁹ Ibid., s 141(2).

⁴⁰ Ibid., s 142.

⁴¹ Ibid., s 165.

165 of the Contracts Act 1950 deems the operator UAV to be in breach of his duty and contract.

5.2.5.1 Liability of UAVs as an Agent or Servant

The crucial question is what would happen if the UAV itself functioned as the principal owner's agent. How does the law resolve this transfer of accountability to the UAV, a non-human? The fact that UAV is non-human thus cannot convict non-humans liable for tortious acts thus the court or legislator shall further be ready to provide a proper definition with regards to UAV because it can easily be rebutted by interpreted otherwise. If we define the literal meaning of a person meaning a human surely UAV is excluded from any liability then will create a loophole in upholding justice. Alternately, an agent may be referred to as an electronic agent, a term that can be used to refer to UAVs.⁴² Courts should exercise caution when referring to a drone or UAV as an agent, employee, or servant, regardless of how humanlike, humanoid, or mechanoid it appears, because the UAV's master controller or master is in charge of its pre-determined behaviours.⁴³ In a UAV accident occurrence, courts may find it challenging to determine the right attribution of culpability. In such circumstances, it is important to determine and find the person behind the master controller, who serves as the UAV's service provider or programmer who can override the UAV operator's directives.

There is a presumption that a UAV is considered artificial intelligence (AI) with a combination of freedom of expression that mimics human thinking and can solve a problem.⁴⁴ This is due to the nature of UAV driverless coupled with the level of

⁴² Harris, 73.

⁴³ Ibid.

⁴⁴ Ibid., 103.

intelligence equal to humans. Regardless of the AI, UAV or autonomous UAV, still, the liability is on the shoulders of the owner and the controlled master of the UAV. The UAV has not reached the definition of a person that carries rights and duties in the eyes of the law, it is irrelevant to bring an extension of rights and liability to the unsoul autonomous machine. When a master controller or master obtains a rented drone and gives the impression that the UAV is acting on behalf of their company as their servant or slave, the apparent agency turns into a complicated tort law issue.⁴⁵ No matter how the master or owner tries to avoid responsibility by claiming an agency or employment relationship, they are still held vicariously accountable for the tort the UAV committed.

It is likely to have a chain of liability *vis-à-vis* determining the master controller of the said UAV. The master controller here refers to the operator who holds the airworthiness certificate and has actual knowledge of handling UAVs. Vladeck⁴⁶ explained in his article that to consider machines as "agents" of some legal person (individual or virtual), product liability law must be able to resolve the legal concerns surrounding their introduction without considerable adjustment.⁴⁷ When the unavoidable occurs and these machines cause damage or injury to a person or property, the law is not necessarily equipped to resolve the legal concerns of machine behaviours. It is unfair to hold the operator liable for the tortious act if the court neglects the types of transactions and agreements between the parties involved in the particular transactions.

The rule of who provides the command of such flying UAVs is an appropriate test in deciding tortious liability under the commercial agreement affecting the agency

⁴⁵ Harris, 74.

⁴⁶ Vladeck, D.C., "Machines without Principals: Liability Rules and Artificial Intelligence", *Wash. L. Rev.* 89, (2014):149.

⁴⁷ Ibid.

and the principle of vicarious liability and strict liability involved in UAV cases. In Canada, AI machines, robots, and even UAVs cannot be held civilly liable for acts or omissions that cause damage to third parties.⁴⁸ Article 1465 of the Civil Code (Canada) provides, that whoever is entrusted with the custody of a thing is liable for reparation for injury resulting from the autonomous act of the thing unless he can prove otherwise.⁴⁹ Canadian law adopts the concept of possession in determining liability instead of the test of who controls or who owns the machines. All liabilities shall be enforced on persons, especially on the owner or the operator of the UAV. The concept of who owns the machine is the test to measure liability, then he shall be responsible for liabilities that occur as a result of the damage caused by the machines.

The overlapping contractual liability and tortious liability of the owner and operator of commercial UAVs would cause a complex issue in determining the actual tortfeasor. The question of strict liability where employment contact exists and the issue of vicarious liability may solve the issue of liability. Nevertheless, the more compounding problem may exist involving other commercial transactions in determining liability when it involves the tenancy or leasing agreement, whereby a master controller or the operator obtains a leased UAV and creates an illusion that the UAV is acting on behalf of their business as their servant or slave. Then who should be responsible for the tortious act committed by the UAV under the leasing agreement? Determining the actual tortfeasor is challenging if involve multi-tier commercial transaction is involved in the commercial UAV. The appropriate test for determining liability in tenancy and leasing transactions is by unmasking the agreement where the rule of strict liability will be applied to whoever has control over the said UAV at that

⁴⁸ Castel, M. E., and Castel, J., "The Impact of Artificial Intelligence on Canadian Law and the Legal Profession", *Advocates' Quarterly*, 46(1), (2016): 42.

⁴⁹ Civil Code of Quebec 1991, (Canada).

particular time. In brief, all commercial UAV companies may determine the best commercial transactions that suit their business plan to foresee future liability that arises from various commercial transactions.

5.3 THE MANUFACTURER: STRICT LIABILITY v BREACH OF WARRANTY

The duty that arises for the manufacturer is based on two aspects; firstly, under the doctrine of tort law which is the strict liability rule; and secondly duty arises due to a contractual basis; breach of warranty. Under the principle of strict liability, the plaintiff shall ensure that the tortious act has been committed by the defendant manufacturer and has caused injury to the plaintiff. The injury here could be physical, or even economic loss. However, under the principle of breach of warranty, there shall be a contractual agreement exist between the plaintiff and the defendant manufacturer before claiming the breach of warranty. Usually, the purchaser of the UAV or the owner of the UAV has a *local standi* in breach of warranty. Preamble 4 of the EASA Commission Delegated Regulation (EU) 2020/1058 provides the important role of the manufacturer of UAVs to deliver good quality as per the standard required by EASA, the provision mentions as follows:

“Where manufacturers place UAS on the market with the intention of making them available for operations under the rules and conditions applicable to the ‘open’ category or under an operational declaration and therefore affix a class identification label on it, they should ensure the compliance of the UAS with the requirements of that class. Equally, where manufacturers place on the market accessories kits transforming a class C3 UAS into a C5, they should ensure compliance of the UAS fitted with the accessories kits with all the requirements of class C5.”⁵⁰

⁵⁰ EASA Commission Delegated Regulation (EU) 2020/1058, preamble 4.

Furthermore, Article 6, paragraph 1 of EASA Delegated Regulation (EU) 2019/945 provides the duty of manufacture-to-manufacture UAVs when placing them in the Union market according to the specification and in compliance with the requirement set out in Parts 1 to 6, 16 and 17 of the Annex. Malaysia has yet to include the provision on the liability and duty of manufacturers in the law and regulation affecting UAVs. Even none of the CAAM's directives provide specific guidelines for the manufacturer. The rationale could be most manufacturers are from outside the country and most of the UAVs are imported rendering it to be impossible to impose such a requirement. This leaves the unintended legal issue of to what extent the manufacturer is liable to deliver its product to the end customer.

Therefore, this points to the issue of strict liability. In the principle of strict liability, the manufacturer will be held strictly liable for a tortious act if he delivered a defective product to the customer and consequently injured the customer. Since the UAV is considered an electronic vehicle, therefore the manufacturer is also owed a duty of care towards the customer to deliver a safe and proper product. The liability in UAVs can be extended to the manufacturer. The doctrine of strict or absolute liability under the law of torts also will apply to the manufacturer when the product itself is under the heading of abnormally dangerous activities. How to determine and define the word 'abnormally dangerous activities' is subjective nature according to the locality and adaptation of the society. Let's put this analogy as an example, a tiger and a lion are considered domestic pets as it is common for that society to adopt such wild animals as domestic pets, in contrast, pets such wild animals in Malaysia have still considered abnormally dangerous activities thus the keeper would be held liable under the strict liability if that wild animal injured any person. Therefore, if the UAV especially

commercial UAV is measured as abnormally dangerous activities and may place the doctrine of strict liability thus the evaluation of risks should be managed properly by the manufacturer and all parties handling the said UAV, especially the commercial UAV. The manufacturer of commercial UAVs carries heavy burdens to maintaining safety while increasing their profits. The UAV manufacturers and providers may try to establish that they are immune from liability in some situations, citing varying legal standards of accountability for the activities of an employee whose use of the UAV resulted in bodily injury. If the manufacturer must ensure that all his products or the UAVs meet the certain quality standard required by the law and if they ignore such quality standards then they are liable in a court of law. It is an implied warranty of the manufacturer that if a product is released in the market, it shall meet the quality standard and functionality as it is.

We cannot ignore the fact that risk reduction is logically preferable to allowing UAVs to be employed to improve our society. Although the action may be unusual or odd, we cannot impose too many restrictions on UAV operations, notably if the end goal is to reduce dangers and for the sustainability of the nation's economy. Appropriately, new technology like UAVs shall be ruled by the doctrine of strict liability rather than the ordinary negligence rule.⁵¹ Thus, strict liability appears as the best principle in guiding matters of future cases involving the liability of the manufacturer for injuries caused by flying UAVs. Neither the plaintiff nor the defendant will prove their negligence when the case is conducted under the doctrine of strict liability. The law of torts embraces that manufacturers are strictly liable for the products they sell; thus, the manufacturer must deliver safe products to the end customers.

⁵¹ Harris, 103.

However, to what extent the manufacturer is liable for the defective product? Does any accreditation need to bring the manufacturer to court? In the case of *Greenman v. Yuba Power Products, Inc.*,⁵² the California Supreme Court decided that if a manufacturer places an article on the market knowing that it would be used without even being inspected for defects, he is strictly liable in tort if the article turns out to have a defect that causes a human person to be injured.⁵³ In addition, in the case of *Am. Family Ins. Co. v. Hewlett-Packard Co.*,⁵⁴ after multiple forensic tests, to verify the fault rested with Sony Energy and Sony Taiwan production, the court ruled that Sony laptop batteries that caused fires or even explosions were unreasonably defective.⁵⁵ The doctrine of strict liability is further extended not only to the manufacturer but also to the sellers of the UAV at the wholesaler and retailer levels.⁵⁶ Moreover, Canadian law also highlights the concept of strict liability on the manufacturer where article 1468 of the Civil Code of Quebec 1991 provides that the manufacturer of movable property is liable to compensation for injury caused to a third party because of a safety defect in the thing.⁵⁷ Article 1469 further classifies safety defects which include all the circumstances like its design or manufacture, poor preservation or presentation, or a lack of sufficient indications as to the risks and dangers it involves or as to safety precautions.⁵⁸

Castel and Castel⁵⁹ suggested that another way to facilitate the victims of damage caused by UAVs or driverless vehicles is to resort to product liability,⁶⁰ where there must be a contractual agreement between the parties usually between the seller

⁵² *Greenman v Yuba Power Products Inc* (Cal. 1963) 377 P.2d 897.

⁵³ *Ibid.*

⁵⁴ *Am. Family Ins Co v Hewlett-Packard Co* (S.D. Ind. Sept. 28, 2011) No. 1:10-cv-01124-JMS-DML, 2011 WL 4550155.

⁵⁵ *Ibid.*

⁵⁶ Harris, 68.

⁵⁷ Civil Code of Quebec 1991, (Canada).

⁵⁸ *Ibid.*

⁵⁹ Castel & Castel, 44.

⁶⁰ *Ibid.*

manufacturer and the purchaser (the owner or operator of UAV). The plaintiff of the case must be the purchaser of the UAV to establish a *local standi* in a contractual relationship with the manufacturers. In the case of manufacturing UAVs, it is notable that manifold participants are contributing to UAV manufacturing, programming, and testing who had indirect control over the entire vehicle. The context of the manufacturer here is to include the hardware manufacturer as well as the software programmer who contributed to the manufacturing of the UAV. They all have the same duties and liability as manufacturers in the eyes of the law. From the context of contract law, alternatively, the manufacturers shall inspect the quality of their products whether have met the standard quality approved by the law or not. Alternatively, if a defective UAV blasts by itself, the economic loss rule would administer the claim, and the owner of the UAV may sue the manufacturer based on breach of warranty. Nevertheless, the plaintiff shall be alert to the statute of limitation before bringing the case for a defective UAV.⁶¹

There shall be malfunctions that exist from the very beginning of the ownership resulting from the defective product by the manufacturer to claim that the manufacturer is liable for breach of warranty. Assuming that the UAV ceases to perform according to its pre-programmed functions or suffers some form of internal damage, due to that the plaintiff suffered economic loss due to the non-functioning UAV. Thus, the proper cause of action that the plaintiff could bring to the court is under the breach of warranty. Breach of warranty involves the physical damage of the product and the plaintiff suffers an economic loss due to the defective product. The UAV itself is categorized under abnormally dangerous activities under strict liability rule, the manufacturers shall provide high standard quality in delivering the product to the end buyer. However, if

⁶¹ Harris, 83.

the manufacturers do otherwise, they may place the customers in imminent danger and economic loss. If a manufacturer of a delivered UAV, for example, did not include the proper safety materials needed for protecting the drone's battery and caused an explosion, then the manufacturer transgressed upon the basic expectation that the drone should be safe to use in its surrounding environment.⁶² There are two tests in determining the breach of warranty, 1.) Risk-utility test and 2) the consumer contemplation test. Harris⁶³ further illustrated in his article in determining the liability of UAV manufacturers for defective products and breach of warranty as follows:

“If a plaintiff is injured by a defective UAV, he or she only needs to show:(1) that the UAV was defective at the time it left the defendant's possession,(2) that the UAV was set to reach the consumer without change, and(3) that the consumer received the UAV with the expectation that it would not put them in danger.”⁶⁴

Even the Rwanda law also sets provisions specifically for the manufacturer in their UAV regulation. This is reflected in an alert for all manufacturers of UAVs to properly deliver a safe and proper UAV to the market. It is mentioned in Subpart E of Rwanda Civil Aviation Regulations (Part 27 Unmanned Aircraft Systems) 2019. This Part applies to any manufacturer who intends to declare the demonstrated capabilities of their UAV to the RCAA for a specific operation and the manufacturer shall comply with the tests, analysis, inspection, or industry standards that have been determined and acceptable by the RCAA. The manufacturer shall make a declaration specifying the manufacturer of the UAV, the model of the system, the maximum take-off weight of the UAV, the operations that the UAV is intended to undertake, and the category of

⁶² Harris, 68.

⁶³ Ibid., 86.

⁶⁴ Ibid.

UAV, such as fixed-wing aircraft, rotary-wing aircraft, hybrid aircraft or lighter-than-air aircraft; and further shall specify that the system meets all required means of compliance to the operations for which the declaration was made.⁶⁵ The means of compliance specified in this Subpart E refers to data of the results or the justification used to demonstrate the UAV meets its safety case (tests, analysis, industry consensus standards) for the specified operation.⁶⁶ This is important for the manufacturer to ensure the UAVs establish the achievement of or equivalency to the safety level identified by RCAA. Furthermore, According to Note 8 of the Rwanda Civil Aviation Regulation 2019, the manufacturer is responsible for ensuring the airworthiness of the UAV.

In Malaysia, every UAV, especially for commercial purposes, must undergo accreditation by SIRIM as a requirement under CAAM. Commercial UAVs generally will undergo some modifications suited to their specific purposes. For example, the UAV for agriculture surely has to be modified to fill spray fertilizer tanks and other advanced functions. UAV for advertisement may include a speaker or monitor for commercial advertisement. SIRIM must provide a list of quality control standards that are approvable and accredited as safe to use specifically for different types of commercial use involved in UAVs. Nowadays, due to the evolving different types of commercial UAVs, thus the spec of each type of commercial UAV requires different safety quality control. Then how to bring the manufacturer to court for a defective product if the UAV itself has breached the product warranty by doing modifications to the UAV? As a result, injured victims cannot be adequately compensated by the vendors if the UAVs have been modified or rebranded and completely changed the initial spec. In Malaysia, Vortex Edge Sdn Bhd is the first developer of UAVs. This company offers

⁶⁵ Rwanda Civil Aviation Regulations 2019 (Part 27 Unmanned Aircraft Systems), r 27.285 (3) (i) and (ii) of subpart E.

⁶⁶ Ibid., r 27.280 of subpart E.

an extensive set of systems, services, and information delivery products to ensure that customers achieve satisfaction with the customized UAV. The strict liability of the manufacturer can only be applied in Malaysia if the UAV has not undergone any changes and modifications.

5.4 FORESEEABLE RISK, THE GRAVITY OF RISK, AND RISK ASSESSMENT BY CATEGORIES OF COMMERCIAL USE OF UAV

The emergence of UAVs in the commercial sector has raised concerns in the community about public safety. The risk associated with UAVs would give rise to a legal problem of negligence. The Short-term Insurance Act 1998,⁶⁷ defines risk as the possibility that a specific event will occur during the period for which a short-term policy is in effect. Risk and safety are intertwined, yet their functions are distinct. Risk usually refers to the outcome of a single action that can be predicted. On the other hand, safety entails the prevention of harm and risk. Risk and safety must be adhered to by the person who owes the duty of care to avoid such risk. Nonetheless, if that person fails to avoid such risk by ignoring the safety procedures, thus he will be liable for negligence. In aviation, risks are classified as either air risks (UAVs crashing with other aircraft) or ground risks (UAVs colliding with people or property on the ground).⁶⁸ Damage to the ground from UAVs is perhaps the most dangerous to consider, as well as the risk most likely to have legal implications as compared with the air risks where there is a relatively low chance of accident and collusion.⁶⁹

The owner and operator or pilot of a commercial UAV owe a duty of care in operating UAVs for the safety of the public. An obligation to prevent foreseeable risks

⁶⁷ Short-Term Insurance Act 1998 (Act 53), (South Africa).

⁶⁸ Vines *et al.*, 304.

⁶⁹ Ibid., 305.

of injury to everyone within the realm of an actor's capacity to cause damages is mandated under tort law.⁷⁰ Risk is regarded as a prediction of the future harm of every liability. The connection of risk and duty forms a conclusive element in the creation of liability in negligence cases. If the risk of a UAV is foreseeable to the operator or pilot thus, he owes a duty of care under the tort law to avoid such harm. The defendant's assessment of risk is the starting point for determining negligence; he is judged using a reasonable man standard, which is strengthened by his special knowledge, intelligence, and judgement.⁷¹ General knowledge and customs of the community are essential in the assessment of risks.⁷² In this scenario, there was foreseeability as to the negative ramifications of UAVs that flew in the skies above people and property and were extremely vulnerable to wind.⁷³ The use of a UAV poses several risks, not only to the pilot or operator but also to those on the ground and the property below. Another issue that most members of the community would be concerned about is falling objects from UAV operations. After a collision, a UAV may rebound onto a sidewalk or fall into the street, potentially injuring a large number of pedestrians and drivers. Although monitoring all shipments flown above the neighbourhood would be difficult, if not impossible, establishing a limit on hazardous or other risky materials would ensure that liability was easily determined in the event of an accident. The first record of a judicial judgement in the area of air law was documented in 1822, confirming predictions about the potential for risk arising from aviation. In the case of the U.S. case of *Guille v. Swan*,⁷⁴ Swan's vegetable garden was where Guille's balloon had landed out of control.

⁷⁰ Perritt, 23.

⁷¹ Ibid., 24.

⁷² Restatement (Second) Of Torts, (Am. Law Inst. 1979), s 290.

⁷³ Fox, S., "Positioning the Drone: Policing the Risky Skies", *Issues in Aviation Law and Policy*, 18(2), (2019): 302.

⁷⁴ *Guille v Swan* (N.Y. 1822)19 Johns 381.

Swan's garden and fence were damaged as a result of this tragedy and the activities of the inquisitive bystanders who hurried to help. The Court decided that Guille was liable (regardless of negligence) for the balloon's damage as well as the crowd's damage.

While it is difficult to eliminate all risks, a sense of protection is used to minimize them or, at the very least, to provide some type of assurance should the risk-foreseen situation occurs.⁷⁵ Risk permits basic principles to be transformed into explicit forms of legal process regulation through logical operations over concepts.⁷⁶ The risk could be positive or negative. Generally, risk can be classified into four namely; 1) individual risk; 2) statistical risk, 3) predicted risk, and 4) perceived risk.⁷⁷ Individual risk is a real risk that is ascertained by the circumstances. Statistical risk is determined by examining available data on incidents and accidents that are directly related to the concern. On the other hand, the predicted risk is based on pertinent historical studies and analytical modelling. Perceived risk is an individual's sense of risk, whether intuitive or not. The risk that possibly occurs in the aviation and UAV industry is the perceived risk where the perception of positive risk could turn out to become a negative risk and thus may lead to negligence issues for instance; accidents and crashes. Mitigation of risks would protect lives as well as property from possible danger and thus enshrine the principle of human rights and *maqasid shariah*.

With regards to the flying objects, it has been excluded by CAAM under its directive of the Civil Aviation Directives 6011 (I) – Remote Pilot Training Organisation (CAD 6011 (I) – RPTO) which among others are a paper aeroplane, hand-launched

⁷⁵ Fox, 303.

⁷⁶ Abramov, V.V., "Definition Safety in Civil Law and the Legislation", *Perm University Herald Juridical Sciences*, 14, (2011): 59.

⁷⁷ Sage, A.P., & White, E.B., "Methodologies for Risk and Hazard Assessment: A Survey and Status Report", *IEEE Transactions on Systems, Man, and Cybernetics*, vol. 10, no. 8, (1980): 425. Further discussed in Fox, S., "Mobility and Movement Are Our Fundamental Rights Safety & Security Risk, Choice Conflict", *Issues in Aviation Law and Policy*, 17(1), (2017): 11.

glider, Frisbees, darts and other thrown toys.⁷⁸ The term "UAV" refers to a machine that can obtain support in the atmosphere from reactions of the air other than reactions of the air against the earth's surface. It provides an overview of the expected atmosphere's ability to support a flying machine that could endanger the public or property if the operator or pilot fails to perform their duties in handling the UAVs. The 'See and Avoid' principle used in manned aircraft is referred to as 'Detect and Avoid' for UAV operations.⁷⁹ The safety guidelines for commercial UAVs are generally set by the CAAM where CAAM has implemented various operational safety guidelines that are connected with the commercial UAV. Nevertheless, these safety guidelines are not specifically designed for one particular operation.

As we know, commercial UAVs have offered many fields in the commercial arena for example logistics and delivery, surveying, agriculture, and others. Thus, each commercial field shall have different and separate standard operational procedures to meet the purpose of the particular commercial UAV. For example, CAAM has regulated the Civil Aviation Directive Part 6011(II) Agriculture UAS Operations (CAD 6011 Part(II) – UAS AGR) which is specially drafted for the agricultural use of UAVs. Without sufficient safety precautions, near incidents could escalate into actual collisions as the usage of UAVs escalates in both private and commercial sectors.⁸⁰ However, apart from negatively affecting aircraft, a falling UAV could easily harm bystanders.⁸¹ Aside from being fully or partially automated, UAVs use a lot of the same technology as model helicopters and planes and thus pose the very same risks.⁸² Due to possible

⁷⁸ CAD 6011 (I) – RPTO, r 1.7.1 (b).

⁷⁹ Ibid., r 1.6.4.

⁸⁰ Anderson, A.M., "Look, up in the Sky!: Regulating Drone Use to Protect Our Safety and Privacy", *Temple Law Review Online*, 88, (2015-2017): 70.

⁸¹ As an example, consider a UAV falling from an apartment balcony and nearly colliding with a pedestrian.

⁸² Anderson, 71.

dangers posed by a UAV's weight and rotors, as well as the limited airspace available in skyscraper-filled big cities, this requirement appears insufficient.⁸³

The revolution in UAV industries classified UAVs according to their features which are micro-drones and macho-drones.⁸⁴ A micro-drones which the Federal Aviation Authority (the USA) recognises as "sUAS" (small unmanned aircraft systems) can match manned helicopters. The micro-drone is commonly used for operations in public safety, newsgathering, power line and pipeline patrol, marketing of real estate, agriculture, and construction.⁸⁵ Because the feature micro-drone is light and small the operation of micro-drones is currently laid out for other commercial purposes. Usually, micro-drones are multi-copters, quadcopters for smaller items, and hexacopters or octocopters for larger products.⁸⁶ Another benefit of the micro-drone is that it can fly at high altitudes and in dangerous areas that cannot be achieved by manned helicopters and can fly in small areas and remote targets as well. Micro-drones deliver the new capability for low prices and are fit for aerial activities. For example; the Axis Vidius drone, which is smaller than a computer mouse, flies with a 3.7-volt battery as its power source and can be controlled *via* the smartphone of the operator.

Further, the new term macho-drones " refers to a larger type of UAV. Its size is as large as a manned helicopter and its design is still awaiting approval from the regulatory. Macho-drones are more likely to have propulsion systems for fuel, diesel, turboshaft or propeller to allow greater fortitude and range than those available for smaller vehicles.⁸⁷ Unlike micro-drones, macho-drones consider late arrival in the

⁸³ Anderson, 74.

⁸⁴ Perritt, H., & Sprague, E.O., "Drones", *Vanderbilt Journal of Entertainment and Technology Law*, 17(3), (2015): 676.

⁸⁵ Ibid.

⁸⁶ Perritt, H., & Plawinski, A.J., "One Centimeter Over My Back Yard: Where Does Federal Preemption of State Drone Regulation Start", *North Carolina Journal of Law & Technology*, 17(2), (2015): 316.

⁸⁷ Ibid., 317.

market as the adaptation of this kind of UAV for military missions and not suitable for commercial and private use. A UAV weighing more than 20 kilograms is considered a macho-drone. The system in the macho-drone is auto-pilot and pre-programs mission. Search and rescue mission is one type of macho-drone that may offer and provide similar to the manned rescue helicopter like more in a disaster area where no human or large vehicle is incapable of reaching. The macho-drones could fly for a longer duration approximately six hours at heights above the ground from two hundred feet to three thousand feet and may speed accordingly at the option of the operator or the system of UAV.⁸⁸ Further, macho-drone will be able to carry and load heavy objects and goods at higher altitudes as compared with micro-drones. This kind of feature could be suited for commercial purposes, especially for shipping and logistic purposes. The question of greater capability comes with greater risk. That is why macho drones are only suitable for law enforcement, intelligence agencies, and military missions.

As for Malaysia, micro-drones on the other hand were classified by legislation by their weight and class. There are three classes of UAVs which are; open, specific and classified. The EASA has categorized the UAVs according to the risk-based approach which has been followed by Malaysia. The risk-based approach in UAV flight is analysed by the energy, mass, size, and complexity of the UAVs, as well as the nature of the UAV operation, which includes the risk of harm to community members, mid-air collision with manned aircraft, and damage to critical and sensitive infrastructure. A mid-air collision could occur if the operator fails to notice exactly what is going on around the UAV in mid-flight and is unable to avoid a manned aircraft in time, particularly those that normally fly at or below 500 feet, such as helicopters and

⁸⁸ Perritt & Sprague, "Drones", 699.

agricultural aircraft.⁸⁹ A system failure, or instances where the UAV flies outside the signal range or via frequency interferences, can result in the loss of control of the UAV. If a drone operator loses control during a building inspection and the UAV crashes into a vehicle or shop, for example, the operator could face ultimate culpability.⁹⁰ Figure 5.2 provides the categories of UAVs based on the risks and weight as introduced by EASA and adopted in Malaysia regulations as follows:

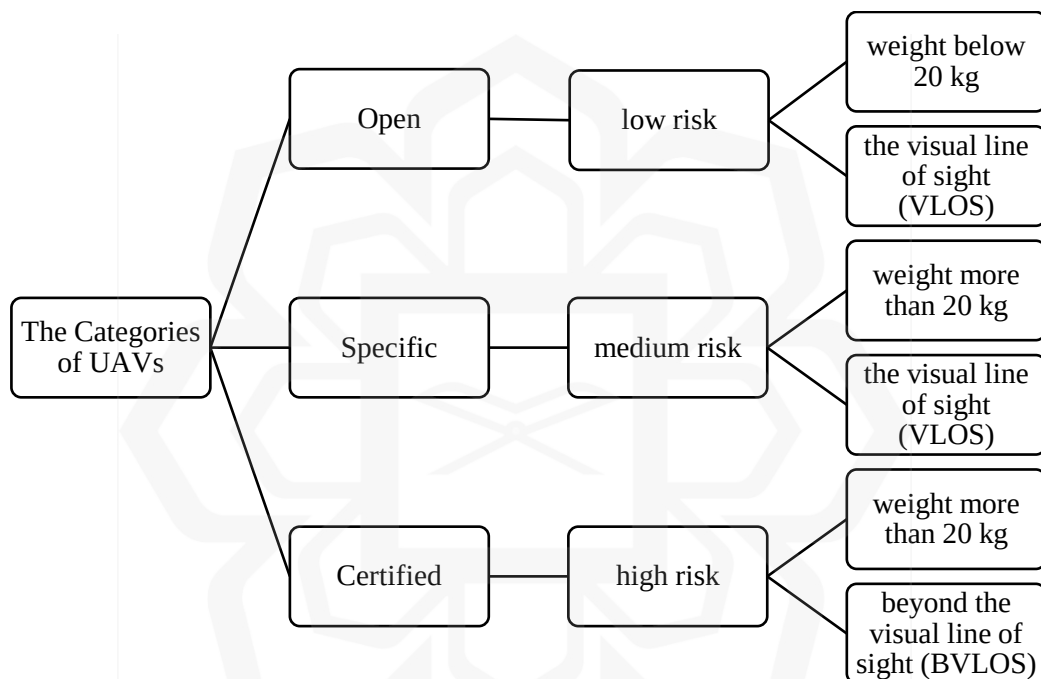


Figure 5.2 The Categories of UAVs based on the Risks.

5.4.1. The low-risk or open category

The UAV's weight below 20 kilograms is listed under the open category of low-risk UAVs. The CAAM refers open category of UAV as a small unmanned aircraft

⁸⁹ Huneberg, S.S., "On Drones, New Risks and Insurance", *Tydskrif vir Hedendaagse Romeins-Hollandse Reg (Journal for Contemporary Roman-Dutch Law)*, 80(4), (2017): 590.

⁹⁰ Ibid.

considered a low-risk UAV that typically masses less than 20 kilograms.⁹¹ The EASA on the other hand classified open-category UAVs as unmanned aircraft which has a maximum take-off weight of less than 25 kilograms.⁹² There is a difference of 5 kilograms between EASA regulations and CAAM regulations. Usually, this category is not required to be registered under the CAAM. Nevertheless, according to the CAAM Standard Requirement for the Application of Drone Permit (Below 20kg) UAS 02/2019, flight approval and permits are required for this type of UAV as well where the CAAM took into consideration Malaysia's busy airspace populated with the urban environment for the safety of public and manned aircraft.⁹³ Typically this type of UAV is small and light with the basic functionality of small UAVs. This kind of UAV is suitable for recreation, hobby, and leisure.

The classification of UAV by CAAM is transplanted from the EASA Commission Regulation where the preamble 8 of the Regulation mentions as follows:

“Operations in the ‘open’ category, which should cover operations that present the lowest risks, should not require UAS that are subject to standard aeronautical compliance procedures, but should be conducted using the UAS classes that are defined in Commission Delegated Regulation (EU) 2019/945.”⁹⁴

There is a leniency by EASA regulation for the open category of UAVs where the operator and pilot are not subject to standard aeronautical compliance procedures but shall observe the EASA Commission Delegated Regulation (EU) 2019/945.

⁹¹ Civil Aviation Regulation 2016 [P.U.A 97], Regulation 2. See also in the CAD 6011(1)-RPTO, r 1.4.4. For further information see CAAM, “Unmanned Aircraft System (UAS)”, <<https://www.caam.gov.my/public/unmanned-aircraft-system-uas/>> (accessed on 10 June 2023).

⁹² EASA Commission Implementing Regulation 2019/947, art 4(1)(b).

⁹³ CAAM, “CAAM Standard Requirement for the Application of Drone Permit (Below 20kg) UAS 02/2019”, (2019), <https://www.caam.gov.my/wp-content/uploads/2021/03/CAAM-Drone_Requirement_2020.pdf> (accessed on 27 August 2023).

⁹⁴ Commission Implementing Regulation 2019 (2019/947), (EU), preamble 8.

Meanwhile, in Malaysia, by virtue of Rule 1.4.4.1 of the Civil Aviation Directives 6011 (I) – Remote Pilot Training Organisation (CAD 6011 (I) – RPTO) the operator and pilot for the open category is subject to the law as well, particularly in obtaining a remote pilot certificate. Further, preamble 15 of the Commission Implementing Regulation (EU) 2019/947, provides as follows:

“Studies have demonstrated that unmanned aircraft with a take-off mass of 250 g or more would present risks to security and therefore UAS operators of such unmanned aircraft should be required to register themselves when operating such aircraft in the ‘open’ category.”⁹⁵

Although the smaller UAVs may not pose a significant risk to the public, their capacity to remain undetected while recording video or photos with surveillance equipment, as well as their ability to fly in remote regions, may raise privacy concerns. Nevertheless, these privacy concerns should not be the case when unmanned aircraft are considered to be toys.⁹⁶ This category of UAV is rarely used in the commercial arena. Nonetheless, the problems posed by this sort of UAV are primarily related to privacy concerns rather than negligence or safety concerns. With the enforcement and protection under the Personal Data Protection Act (PDPA) and the smart blurring face application attached to the gadgets, the privacy issue related to UAVs can be managed.

5.4.2. The medium risk or specific category

The specific category of UAV is described as a medium-risk UAV which is required to fly within the visual line of sight (VLOS). This type of medium-risk category needs prior approval from CAAM for its operation. Typically, it weighs more than 20

⁹⁵ Commission Implementing Regulation 2019 (2019/947), (EU), preamble 15.

⁹⁶ Ibid., preamble 16.

kilograms. In addition, according to preamble 9 of the Commission Implementing Regulation (EU) 2019/947 mentions as follows:

“Operations in the ‘specific’ category should cover other types of operations presenting a higher risk and for which a thorough risk assessment should be conducted to indicate which requirements are necessary to keep the operation safe.”⁹⁷

The UAVs that fall under this category are classified as operations that are covered under Standard Scenario (STS).⁹⁸ The STS is a predefined UAV operation for which a prior operational authorization issued by the competent authority of registration is obligated.⁹⁹ The European Union Aviation Safety Agency (EASA) has developed two standard scenarios for the operations namely; Standard Scenario 1 (STS-01) and Standard Scenario 2 (STS-02). The STS-01 covers VLOS operations using a CE class C5 UAV at a maximum height of 120 meters over a controlled ground area in a populated environment.¹⁰⁰ The STS-02, on the other hand, is an EVLOS operation deploying a CE class C6 UAV at a maximum height of 120 m over a controlled ground area in a scarcely populated area, with the unmanned aircraft at a distance of not more than 2 km from the remote pilot with the presence of airspace observers.¹⁰¹ These types of operations are commonly carried out by commercial UAVs, which typically have different payload designs based on the purpose of their operation.

⁹⁷ Commission Implementing Regulation 2019 (2019/947), preamble 9.

⁹⁸ EASA, Specific Category - Civil Drones, <<https://www.easa.europa.eu/domains/civil-drones/drones-regulatory-framework-background/specific-category-civil-drones>> (accessed on 2 February 2022).

⁹⁹ EASA, Guidelines on Design verification of UAS operated in the ‘specific’ category and classified in SAIL III and IV, Issue 1, (31 March 2021), <<https://www.easa.europa.eu/downloads/126318/en>> (accessed on 2 February 2022).

¹⁰⁰ Commission Implementing Regulation (EU) 2020/639, *Official Journal of the European Union*, (12 May 2020) <<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0639&from=EN>> (accessed on 2 February 2022), see preamble 3.

¹⁰¹ Ibid., preamble 4.

When looking at the EASA medium risk UAV regulation, describes the operation of commercial UAVs that can fly both VLOS and EVLOS over populated areas. The restriction for this type of UAV demonstrates that risk evaluation must be rigorous because it impacts the public at large. Furthermore, the operator is required to produce insurance coverage upon registration of such operation under this category,¹⁰² demonstrating the seriousness of mandating commercial use of UAVs in the European Union. Under UAS.SPEC.030 (3) of Commission Implementing Regulation (EU) 2020/639 further required UAS operation in the ‘specific’ category to conduct the risk assessment referred to in Article 11 which includes the following information; (a) the registration number of the UAS operator; (b) the name of the responsible manager or the name of the UAS operator in the case of a natural person; (c) the operational risk assessment; (d) the list of mitigation measures proposed by the UAS operator, with sufficient information for the competent authority to assess the adequacy of the mitigation, means to address the risks; (e) an operations manual when required by the risk and complexity of the operation; (f) a confirmation that an appropriate insurance cover will be in place at the start of the UAV operations if required by Union or national law. The operator of the UAV is expected to prevent any risk of collision with any manned aircraft and to terminate the flight if the operation poses a risk to other aircraft, people, animals, the environment, or property.

5.4.3. The high-risk or certified category

The certified category highlights the high risk of UAVs that weigh more than 20 kilograms. Its operation shall be conducted with prior approval from the CAAM and

¹⁰² Commission Implementing Regulation (EU) 2020/639, UAS.Spec.020 (2)(d) part B Annex.

other agencies for flying outside and beyond the visual line of sight (BVLOS) or extended the visual line of sight (EVLOS). The UAVs under this category are certified or high-risk UAVs based on their weight and their functionality. This type of UAV is typically as big as manned aircraft and sometimes has functionality as the manned aircraft. Any UAV that weighs more than 20 kilograms is classified under the certified category and carries higher risks than other categories of UAVs. Meanwhile, the EASA regulation mentioned in preamble 11 is as follows:

“Operations in the ‘certified’ category should, as a principle, be subject to rules on certification of the operator, and the licensing of remote pilots, in addition to the certification of the aircraft pursuant to Delegated Regulation (EU) 2019/945.”¹⁰³

Certified UAVs usually meant for industrial purposes but the approval and permit to fly under this category are rarely be obtained and approved by the aviation authority. In Malaysia, this category of UAVs is subject to the CAD 6001 Part (V)-UAS SUP where the safety guidelines with regard to the operations and permits are provided in the said directives. This category can do a massive operation as manned aircraft. Because of the nature of UAVs with no human on board and pre-programmed is also another trust issue in the artificial intelligence (AI) program. AI in UAVs is either beneficial or risky for the public if the operation is not assessed properly by the relevant parties in the UAV industry. Due to their mass and speed, larger UAVs have the potential to cause catastrophic damage or injury in the event of a collision. The operation of these UAVs usually involves the EVLOS. Since this UAV can fly beyond the line of sight, it can be used by commercial entities to replace more expensive modes

¹⁰³ Commission Implementing Regulation 2019 (2019/947), preamble 9.

of transportation such as helicopters and satellites.¹⁰⁴ Due to the higher risks associated with this UAV, according to preamble 11 of the EASA Commission Implementing Regulation (EU) 2019/947, this category of UAVs is subject to the Delegated Regulation (EU) 2019/945 which mentions as follows:

“Operations in the ‘certified’ category should, as a principle, be subject to rules on certification of the operator, and the licensing of remote pilots, in addition to the certification of the aircraft pursuant to Delegated Regulation (EU) 2019/945.”

Section 519 of the Restatement (Third) Of Torts renders someone who engages in “an abnormally dangerous activity” strictly liable for the kind of harm that deems the activity abnormally dangerous.¹⁰⁵ The certified category of UAVs is most likely to fall under the strict liability rules where the risks designated with this category of UAVs could be abnormally dangerous to the community. Item 9.3.5 of the CAD 6001-Part(V)-UAS SUP mentions that dangerous goods transported by the UAVs should either fall under the Special UAS project or certified category depending on the types of risks.¹⁰⁶ The guideline to carry dangerous goods is mentioned under CAAM directives where the potentially dangerous goods are also listed in item 9.3.6(a) of the CAD 6011 Part (V) – UAS SUP as follows:

“The following are examples of dangerous goods that might be transported by UA:

- 1) Compressed gases such as aerosols and gas cartridges;
- 2) Flammable liquids, such as ethanol, ether;
- 3) Sterilization materials such as ethylene oxide;
- 4) Infectious substances such as certain medicines;

¹⁰⁴ Calandrillo, S *et al.*, “Deadly Drones: Why FAA Regulations Miss the Mark on Drone Safety”, *Stanford Technology Law Review*, 23(1), (2020): 234.

¹⁰⁵ Restatement (Third) Of Torts 1998, Physical & Emotional Harm, s 20.

¹⁰⁶ Civil Aviation Directive 6011 Part (V) – Unmanned Aircraft System Special UAS Project, (CAD 6011 Part (V) – UAS SUP), chap 9.3.5.

- 5) First aid kits;
- 6) Medical or clinical waste such as used needles and blood samples;
- 7) Safety devices;
- 8) Lithium batteries; and
- 9) Dry ice.”¹⁰⁷

The list above shows the usual commercial goods which are important for certain industries when urgency is needed UAV delivery can transport the dangerous goods to the intended area. This directive works in tandem with the international rule for transporting dangerous goods as per Annex 18 of the International Civil Aviation Organisation (ICAO) – The Safe Transport of Dangerous Goods by Air. In addition, dangerous good is considered a hazard to health, environment, safety and property. Thus, extra precaution is obligatory when carrying dangerous goods. The risk may be reduced in terms of packaging, communication, handling and stowage.¹⁰⁸ The packaging methods are important to avoid the possibility of damage, leakages, spills or unintentional discharge of contents. Furthermore, the additional lists for risk assessment are outlined in item 9.3.7 of the CAD 6011 Part (V)– UAS SUP as follows:

- “1) Identification of hazards associated with the dangerous goods;
- 2) Type of operations;
- 3) Containment characteristics of the UA;
- 4) Packing and packaging;
- 5) Quantity and type of dangerous goods to be transported; and
- 6) Level of competence of those handling the dangerous goods.”¹⁰⁹

Risks associated with dangerous goods are usually associated with the level of toxicity, threatening, infectious and corrosive to humans, the environment, animals and property. Once risk has been identified then the risk will be evaluated by taking into

¹⁰⁷ CAD 6011 Part (V) – UAS SUP, item 9.3.6(1).

¹⁰⁸ Ibid., item 9.3.2.

¹⁰⁹ Ibid., item 9.3.7.

consideration the operating routes, obstacles, altitudes, or take-off and landing areas.¹¹⁰ Nevertheless, the level of care used in carrying out the activity is irrelevant, but the plaintiff must demonstrate injury and causation.¹¹¹ The extent and value of abnormally dangerous activity in UAV operation are weighted and attributed to the acceptance of society and common practices of the neighbourhood. As UAVs become more widely used, their operations are less likely to be labelled as unusually dangerous,¹¹² but this may vary depending on the categories of the UAV and shall not be considered UAV as a single purpose. The principle of strict liability is relevant in protecting the interests of the community until it becomes common in one society.

5.5 SOLUTION: REGISTRATION OF UAV

UAV operators in the United States must register their UAVs to comply with section 1092 of the National Defense Authorization Act, even if they are flying under the Special Rule for Model Aircraft.¹¹³ This rule only applies to commercial UAVs, not to private or personal UAVs, because private-use UAVs are governed by the Small UAS Rule Part 107. Prior to use, registration numbers must be attached to the UAV and must be visible at all times.¹¹⁴ The registration requirement will guarantee that UAVs are handled safely and do not present a security or privacy threat. The ability to trace the chain of UAV ownership and possession is a quicker mechanism to ensure that UAVs are properly registered. The chains of ownership and possession of the UAV can be detected easily for safety reasons in case negligence occurs while operating the UAV.

¹¹⁰ CAD 6011 Part (V) – UAS SUP, item 9.3.8(b).

¹¹¹ Perritt, 25.

¹¹² Ibid., 26.

¹¹³ National Defense Authorization Act 2016, s 1092. This section mentioned the border security metrics.

¹¹⁴ *Drone Registration*, “How to Label Drone”, <<https://drone-registration.net/label-drone/>> (accessed on 4 February 2022).

The UAV operator bears a significant amount of responsibility for inspecting the operating environment, which includes potential risks to injury or damage in direct proximity, both on the ground and in the airspace, as well as other prerequisites and flight restrictions outlined in the flight guidelines. From a public policy standpoint, UAV operation is a preference, not a right or guarantee, and by choosing to fly UAVs, operators accept the responsibilities that come with their actions.¹¹⁵ The right to use UAV is a privilege for which operators should be informed, if not for their self-interest, then for the sake of the greater good of the country.¹¹⁶

Furthermore, the method of registration of an identical number for UAVs is analogous to that of a motor vehicle registration number; this is necessary in order to keep track of the ownership and liability of parties involved in the operation of UAVs.¹¹⁷ The rationale for having a publicly visible registration number for UAVs is to trace the operator and owner of the UAV if they break any laws while operating the UAV, making them accountable for their actions. The plate number, which corresponds to the chassis number or the manufacturing number, is a unique identification number used to distinguish ownership of the UAV. This plate number is not only visible to the public but can also be identified by a specific radar or even new scanning and Bluetooth technology from a specified radius kilometre. This may address the issue of public safety, but it may also provide privacy protection and may go so far as to provide intangible security protection to the community. In Australia, all drones, regardless of size, must register and be accredited with Australia's Civil Aviation Safety Authority

¹¹⁵ Kolarich, B.C., "Playing with Fire: Drone Incursions into Wildfire Suppression Operations and the Regulatory Challenges to Reducing Their Risks", *Texas Tech Administrative Law Journal*, 19(2), (2018): 334.

¹¹⁶ U.S Code 2021 (Title 18, Part 1, Chapter 2), s 39B. See also FAA Reauthorization Act 1998 (Public Law 115-254), s 351.

¹¹⁷ Crenshaw, M., "License Plates for Drones Resolving Privacy Concerns Using Remote Identification Technology", *Journal of Engineering and Public Policy*, Vol. 20 (2016): 1.

(CASA) commencing January 28, 2021.¹¹⁸ As a result, flying unregistered UAVs without a licence from CASA is a strict liability offence.¹¹⁹

Small UAVs and small UAVs for surveillance are not required to be registered in Malaysia. This means that UAVs in the open category with a mass weight of less than 20kg are not required to be registered. However, UAVs weighing more than 20kg must be registered.¹²⁰ It is proposed that all types of UAVs, regardless of weight, be registered so that the chain of ownership can be traced. Using the analogy of motor vehicles, all motor vehicles, regardless of weight or type, are required to be registered with a vehicle registration number to ensure vehicle ownership. In the event of an accident or negligence, the authority and enforcement can readily locate the owner of the UAV if the UAV's registration number is visible and displayed on the body of the UAV. Each UAV has its registration number.

5.6 SOLUTION: RISK MANAGEMENT FROM THE INSURANCE FOR COMMERCIAL UAV

Risk and insurance are inextricably linked, and it appears that the insurance industry as a whole is responding to the growing market for UAV insurance. The primary function of insurance is to protect against future uncertainties and losses. While the specific demarcation and appraisal of risk are still in the works, the insurance shall emerge to cover the liability that comes from the usage of UAVs. Insurance acts to mitigate risks and form a part of the management of risks. The EASA Commission Implementing Regulation (EU) 2019/947 mentions in preamble 20 as follows:

¹¹⁸ Vines *et al.*, 315.

¹¹⁹ Ibid., 316.

¹²⁰ CAAM, Unmanned Aircraft System (UAS), <<https://www.caam.gov.my/public/unmanned-aircraft-system-uas/>> (accessed on 10 June 2023).

“UAS operators and remote pilots should ensure that they are adequately informed about applicable Union and national rules relating to the intended operations, in particular with regard to safety, privacy, data protection, liability, insurance, security and environmental protection.”¹²¹

The issue with insuring technology like UAVs is that insurers generally lack the expertise and historical data to help them understand the precise nature and magnitude of the risks that may arise as a consequence of the use of technological innovation.¹²²

The insured and the insurer enter into a contract in which the insurer agrees to pay the insured a sum of money, or its equivalent, in the event of the incidence of a specified uncertain event in which the insured has an interest in consideration for the payment of a premium.¹²³ Due to the risks involved, especially in the commercial sphere, insurance is required for every UAV. The insurance sector has no choice but to offer the necessary coverage due to the industry's demand.

The obstacle by the insurance company in dealing with the new technology is to determine the nature and the extent of the risk that might occur by the commercial UAVs in operating the safe flight. The majority of nations demand manned aircraft, such as helicopters and planes, to obtain comprehensive insurance that will cover their liabilities in the event of an accident.¹²⁴ As a result, insurers frequently analyse risk using the blueprints of manned aircraft such as aircraft and helicopters. The insurance sector initially approached drone insurance by altering normal aviation wordings on an annual basis, omitting coverage such as passenger responsibility while effectively

¹²¹ Commission Implementing Regulation 2019 (2019/947), preamble 20.

¹²² Huneberg, 587.

¹²³ *Lake v Reinsurance Corporation Ltct* (1967) 3 SA 124 (W).

¹²⁴ Huneberg, 587.

providing users with a typical aviation policy at a disproportionate cost of the issue.¹²⁵ In partnership with Allianz, Flock released Europe's first app-based 'pay-as-you-fly' drone insurance in January 2018 and went on to raise \$17 million for Series A and \$38 million for Series B in 2021.¹²⁶ Commercial and recreational pilots can acquire bespoke equipment and liability insurance on demand (for periods ranging from 1 to 8 hours) via a mobile app. The cost of insurance is 'exposure-based,' which means that the risk is analysed per flight and decided by merging real-time data with algorithmic risk evaluations.¹²⁷

To make insurance to be compulsory for the operation of UAVs several factors may be considered by the authority which is the establishment of a compulsory third-party insurance framework for commercial drone operations that will connect with the larger community interest, particularly in terms of personal safety. In addition, a differential premium model can be established, taking into account factors such as the nature and location of commercial operations, as well as whether the operator is accredited to the applicable UAS International Standard ('UIS') for its operations.¹²⁸ Furthermore, the advantages of having public liability insurance go far beyond individual compensation. In the event of an accident or incident, operators with insurance coverage would become more visible, accountable, and traceable if combined with a strict registration regime.¹²⁹ As a result, the issue of UAV registration must be

¹²⁵ Tarr, J.A. & Tarr M.T.A., "Compulsory Liability Insurance for Drones in Australia", *Insurance Law Journal*, 31 ILJ, (2021): 201.

¹²⁶ Butcher, M., "Born of Drone Tech, Insuretech Flock Raises \$38M Series B to Nudge Commercial Drivers Towards Safety", *Techcrunch*, (28 February 2023), <<https://techcrunch.com/2023/02/27/born-of-drone-tech-insuretech-flock-raises-38m-series-b-to-nudge-commercial-drivers-towards-safety/>> (accessed on 6 June 2023).

¹²⁷ Tarr & Tarr, 202.

¹²⁸ Ibid., 207.

¹²⁹ Ibid.

addressed first to have a last-resort option in UAVs for protecting both the UAVs and the public.

In assessing risks and calculating damage for UAV insurance, manned aircraft insurance is used as a comparator. As a consequence, insurance coverage for commercial UAVs may be extended to customers and the general public, as the hazards will be exposed to the general public as well. A sufficient level of insurance is a critical consideration when analysing the risks and liabilities associated with damage to an innocent third party.¹³⁰ The risk must be certain, as entering into an insurance agreement that involves uncertainty in the subject matter and terms of the contract will result in a void contract. The risk valuation in commercial UAVs must be certain so that the insurance can adequately cover the damage based on accurate facts. The extent of danger imposed by the UAVs shall be calculated promptly by the insurer based on the categories of the UAVs. The regulation of UAVs shall be drafted in the first place thus the insurer may have a complete reference and expertise in drafting the policy.

In constructing an insurance policy, data from SIRIM and other relevant parties will be considered in analysing the dangers of UAVs, particularly in various commercial enterprises. For context, it's critical to know the distinction between manned and unmanned aircraft systems, as well as the magnitude of dangers that unmanned aerial systems pose.¹³¹ The risks associated with the UAVs shall not be assessed as similar to the manned aircraft due to the features, weights, and even the functionality of UAVs being different from the manned aircraft. The risk also is dependent on the expertise of the operator or pilot of UAVs in handling and operating the UAVs. Permit and license by the CAAM and relevant authorities in measuring the operators' skills in operating

¹³⁰ Huneberg, 587.

¹³¹ Ibid., 589.

the commercial UAVs are vital to prove of competency of the operator and after all for the permit to fly commercial UAVs. Some insurers are willing to provide the service if the information on total flight times is provided by the operators or pilots. However, a license is *prima facie* proof to illustrate the skills and expertise of the operator thus the insurer may cover the commercial UAVs without hesitation. Nevertheless, as this technology evolves over the years the insurer shall follow the development of commercial UAVs for the sustainability of the insurance market.

It is imperative to study the capabilities of these UAVs to comprehend the correlation between this technological revolution and the possibility of future discriminatory insurance practices.¹³² The collection and transition of data via UAVs with high-definition cameras in terms of images and video footage are exposing the risk of privacy thus the value in insurability is dependent on the types of UAVs and the development of software connected with the said UAVs. The protection of data and privacy of an individual is exclusively covered by the terms and conditions as required by the law¹³³ and shall be included in the software before the operation of the UAVs. Furthermore, UAV payloads can be customized, enabling insurers to costume a model with whatever they think will help the UAV accomplish its mission and operation. The risks that are exposed here are determined by the types of commercial operations. The payloads of commercial UAVs will be used to calculate the insurance value and risk assessment. Consider AIG's vision for its risk assessment UAVS, which emphasizes the agent-UAV relationship rather than the agent-insured relationship.¹³⁴ The payload of

¹³² Barta, L.M., "Rate Me: Risk Assessment Drones and the Resurrection of Discriminatory Insurance Practices", *Washington and Lee Law Review*, 73(3), (2016): 1563.

¹³³ Personal Data Protection Act 2010 (Act 709).

¹³⁴ ICAO, "Working Paper: Accident Investigation and Prevention (AIG) Divisional Meeting", (2008) <[https://www.icao.int/Meetings/AMC/MA/Accidet%20Investigation%20and%20Prevention%20\(AIG\)%20Divisional%20Meeting/AIGdiv08_WP01_en.pdf](https://www.icao.int/Meetings/AMC/MA/Accidet%20Investigation%20and%20Prevention%20(AIG)%20Divisional%20Meeting/AIGdiv08_WP01_en.pdf)> (accessed on 12 January 2022).

commercial UAVs varies depending on the operation, and the risks posed by such operations are estimated for insurance purposes rather than valuing the operator's competency, which has been validated on paper. Similar to motor vehicle insurance, the risks are evaluated based on the vehicle's capabilities, market values, and years on the road.

Each holder of a certificate of airworthiness (COA) for a Remote Pilot Certificate of Competency must have valid insurance that will cover their liability to third parties.¹³⁵ In other words, only UAVs with a certificate of airworthiness are eligible for third-party insurance. The role of civil authority in aviation has been developed and specialized in response to the growing risks and threats posed by UAVs.¹³⁶ In Malaysia, the Drone Insurance Store has initiated UAV insurance as part of the CAAM requirement for a permit and license to fly commercial UAVs. Insurance in commercial UAVs can be divided into two types depending on the insurer's product availability; firstly, the UAV and any other attachments attached to it are covered under the All Risk/Hull policy if they are lost or damaged by any accident or misfortune due to fire and perils such as lightning, theft by forced entry or exit from premises, or accidental damage.¹³⁷ Pre-qualification assessment is a compulsory process provided by the insurance provider to check the UAV payload whether it is fit to fly or not, to check the competency of the operator or pilot in operating the UAV, and to recommend further training and certification for the completion of insurance coverage to mitigate risks.¹³⁸ Secondly, the Public Liability policy is designed to protect the operator and the company, from any claim for compensation or legal costs arising from bodily injury to

¹³⁵ CAD 6011 (I) – RPTO, r 1.11.1.

¹³⁶ Fox, 305.

¹³⁷ *Drone Insurance Store*, “Public Liability/ 3rd Party Insurance Coverage”, <<https://droneinsurance.store/product/#public-liability>> (accessed on 3 February 2022).

¹³⁸ *Ibid.*

anyone (other than employees or contractors' underemployment or direction for monetary compensation or in-kind) or damage to a third party's property (other than property or property held in trust or on commission) caused by the operator or from the company's activities. Locally this applies to property damage only and is not extended to bodily injury.

Proposing a sufficient regulatory framework for risk assessment drones necessitates (1) an insight into current regulatory efforts relating to commercial drones, (2) an evaluation as to how risk assessment of drones may expose individuals to unfairly discriminatory practices and what countermeasures are available to mitigate those risks, and (3) an assessment of which entities (if any) are best suited to implement such countermeasures.¹³⁹ The evaluation of risks based on the industrial-specific use¹⁴⁰ in commercial UAVs shall be generated individually according to the context of the operation. Unfortunately, the Malaysian insurance industry has not come to that evaluation as yet. Although insurance can secure the commercial UAVs' operation against future claims in accident or negligence from the operator or pilot, the extensive standard procedure of operation by the CAAM shall be obeyed by the operator and pilot from the pre-flight until the post-flight operation. Inadequacy effort in drafting standard operating procedures due to the generality application of the operation of UAVs and not specifically designed per industrial-specific use of commercial UAVs. The new CAAM's mission of integrating UAVs into the national airspace by 2035, carries another weight to facilitate certainty in regulatory aspects of commercial UAVs based on the industrial-specific use method. Thus, each industry will have an individual set of standard operating procedures that suit the operation.

¹³⁹ Barta, 1578.

¹⁴⁰ Ibid.

5.7 SOLUTION: POLICING AND MONITORING

The Specific Operations Risk Assessment (SORA) is the risk assessment methodology being used to support an application for official approval to operate a UAV in a specific category.¹⁴¹ SORA enables the public confidence in the safety of the public by self-evaluation of the specific operation of UAVs. The operator has a duty for the performance and operation of UAVs such as the execution and use of a checklist; use of observers with adequate communication; operations performed by qualified operators with appropriate authorizations; performing operations in specific weather conditions; checking the manned air traffic; checking the availability of airspace; and hardware knowledge.¹⁴²

This method also is proposed by Dufour Aerospace in the EASA document for regulating the assessment of medium-risk UAVs.¹⁴³ The outcome of the risk assessment conducted *per* Article 11 of Regulation (EU) 2019/947 will be the basis for this operational authorization *via* the SORA method. Through using the SORA method of risk assessment, the ‘specific’ category, often known as medium risk, can embrace a wide range of UAV missions. At the time of publication of the EASA Guidelines, the detailed provisions for the ‘certified’ category of operations had not yet been adopted.¹⁴⁴ According to the method of SORA, the mitigation of risks could be divided into two concepts; firstly, tactical mitigations aimed at curbing the likelihood of a mid-air

¹⁴¹ Janik, P. *et al.*, “Unmanned Aircraft Systems Risk Assessment Based on SORA for First Responders and Disaster Management”, *MDPI, Appl. Sci.* 2021, 11, (2021): 5365.

¹⁴² *Ibid.*

¹⁴³ EASA, Item No.2, EASA Special Conditions Light- UAS Medium Risk 01- Issue 1- Comment Response Document, <https://www.easa.europa.eu/sites/default/files/dfu/crd_special_condition_sc_light-uas_medium_risk_01.pdf> (accessed 2 February 2022).

¹⁴⁴ EASA, “Guidelines on Design verification of UAS operated in the ‘specific’ category and classified in SAIL III and IV”, issue 2, 9 August 2023, <<https://www.easa.europa.eu/en/guidelines-design-verification-uas-operated-specific-category>> (accessed 27 August 2023).

collision, applicable during missions and allowing for reactions ranging from a few seconds to several minutes (for example, detect and avoid sensors, TCAS, ADS-B, FLARM, trackers, dynamic geofencing, active communication with ATC and other airspace users);¹⁴⁵ secondly, strategic mitigations directed at minimizing the likelihood of operational volume violations by other airspace users, applied prior to missions, enabling for reactions ranging from a few days to several weeks (for example, operational time frame—day or night, flight in zones, atypical/segregated airspace, geocaching).¹⁴⁶ Further checklist of assessment of risks can be divided into the 5M method; man, machine, mission, management, and medium.¹⁴⁷ Commercial UAVs cover all aspects of economics that vary from their operations, therefore whether this risk assessment by SORA is fit for commercial UAVs or not is a subjective matter. The SORA method of risk mitigation focuses on the surveillance process as part of airspace monitoring. However, in general, the 5M approaches can be utilized as a pre-assessment before UAV take-off for all sorts of operations.

Another option for mitigating the risk of commercial UAVs in low-altitude airspace is to have police patrol the area. The concept of policing refers to the undertaking by which something is regulated, controlled or monitored, etc.¹⁴⁸ Within the EU, it has been proposed that the Civil Aviation Authority (CAA) and the police play a collaborative role in monitoring the advancement of commercial UAVs in the airspace by the year 2050.¹⁴⁹ In that manner, at the very least, some risk will be reduced, which must coincide with public acceptance of the evolving technological environment

¹⁴⁵ Janik *et al.*, 5366.

¹⁴⁶ *Ibid.*, 5366.

¹⁴⁷ *Ibid.*

¹⁴⁸ Fox, 304.

¹⁴⁹ *Ibid.*

that UAVs will continue to develop around us.¹⁵⁰ Though it is seen as added jurisdiction of police in the new era is certainly a good approach in monitoring a legal flight so long it would not be against public policy or even morality. This is also to ensure that commercial UAVs do not violate any laws in the nation and that low-altitude airspace is used peacefully and safely. In the same way that land and sea are safely monitored and patrolled by police, low-altitude airspace should be monitored and patrolled by police for the sake of safety and risk mitigation. It is impliedly covered in the Police Act 1967 (Act 344) which highlights the duties, among others to maintain law and order, to preserve the peace and security of Malaysia, to prevent and detect crime, apprehension and prosecution offenders and the collection of security intelligence.¹⁵¹ Thus, surveillance is a part of the mainstream police force to preserve peace and security in the country which is in wide coverage that includes the land, the sea, and even low-altitude airspace.

Furthermore, the prospect of having cross-border UAVs in the future is being considered. The CAAM ATC can work with the Royal Malaysian Air Force Malaysia (RMAF) ATC to monitor and manage UAV traffic in the area. In addition to the RMP, the RAF might be an enforcement authority for commercial UAVs. The RMAF is currently constructing an ATC system for UAVs in Labuan. In 2020, the RMAF established a new squad for the UAV known as SKUADRO 11, which would be deployed for search and rescue (SAR) missions as well as for surveillance in Malaysia's maritime.¹⁵² This demonstrates Malaysia's readiness to accept this technology by providing national and internal security and safety to the public.

¹⁵⁰ Fox, 312.

¹⁵¹ Police Act 1967 (Act 344), s 3(3).

¹⁵² Fareez Azman, "TUDM Bakal Guna Pesawat UAV Pantau Peraianan Negara-PTU", *Astro Awani*, 18 December 2020, <<https://www.astroawani.com/berita-malaysia/tudm-bakal-guna-pesawat-uavpantau-peraian-negara-ptu-273722?amp=1>> (accessed on 11 June 2023).

5.8 EVALUATION AND CONCLUSION

In brief, the operator's competency and the airworthiness of the UAV are two crucial factors in instilling confidence in the public, that such certifications would guarantee their safety. The operator and owner of UAVs must keep the public's safety by being competent in operating the UAV. Manufacturers, on the other hand, must ensure that the UAVs they produce are fit and accredited to fly for commercial purposes. Further, the manufacturers are responsible for delivering a sound and safe UAV to the customer as the rule of strict liability stood still in the torts law. Proper quality inspections and multiple tests are needed before the UAV is declared fit for customer usage. Hence, the role of SIRIM in providing accreditation is needed and required for the license of operation of the commercial UAV. Commercial UAV accreditation will differ depending on the operation and type of UAV due to the different functionality and safety requirements associated with the operations. The CAAM should not give a single set of guidelines for all sorts of commercial UAVs; instead, distinct criteria for approving permits and licences should be provided based on the types of operations. The components of UAVs used in agriculture are distinct from those used in shipping and delivery, requiring different guidelines. Moreover, the liability of all relevant parties involved in the formation of commercial UAVs shall be properly determined based on the agreement or contract that they are entering. The liability arising from the use of the UAV must be extended to the master controlling or the registered owner of the UAV and shall not be interpreted in literal meaning. This is to prevent a cascade of legal actions against commercial UAV operations. The competence of the operator

would ensure public safety, while the airworthiness of the UAV would instil confidence in the use of the technology.

Additionally, the evaluation of risks for all types of UAVs is necessary as a pre-condition for a permit and license to fly the UAV, especially commercial UAVs. Malaysian laws and regulations governing commercial UAVs must be revised to accommodate the use of commercial UAVs in Malaysia, making it a reality in Malaysia. The current regulations in Malaysia are not clear on issues of liabilities and risks connected with the use of commercial UAVs. How to define security if the shield is not even there to protect the public and to build trust in the operation of commercial UAVs? The insurance industry for the UAV is capable of growing like the technology itself. The growth of UAV technology means the growth of risks as well thus the assessment of risks for the UAV will keep up to date and relevant for the interest of the industry and the public. The insurance industry shall collaborate closely with the UAV industry to ensure the laws and policies are met and relevant to all parties and grant comprehensive protection to the public.

It is recommended that insurance be made compulsory not only for commercial UAVs but also for the private use of UAVs for the safety of the public. All UAV owners must have insurance coverage to protect themselves from the numerous risks arising from the use of this technology.¹⁵³ Insurance regulations for commercial UAVs must remain strict but not overbearing to the sector for commercial UAVs to flourish in Malaysia. Considering CAAM has mostly followed EASA regulations in regulating commercial UAVs, SORA's method of risk assessment may be the best method for

¹⁵³ Huneberg, 601.

assessing risks for a specific category of UAVs that seems to be widely applicable to commercial UAVs.



CHAPTER 6

RECOMMENDATION AND CONCLUSION

6.1 INTRODUCTION

The previous chapters have examined the loophole of law for the commercial use of UAVs in Malaysia by discussing the legal implications connected to such lacuna. Thus, this chapter provides a summary of findings for all of the in-depth studies in the previous chapters which are significant for the growth of Malaysia's economy, business entities and public. Further, the recommendations to enhance the laws are also examined in this chapter to have a balance in providing a comprehensive law for the use of commercial UAVs and to protect and gain public confidence.

In this vein, this chapter suggests policy development and other possible issues for future research. Lastly, this chapter concludes the research with the hope that the regulator is ready to transplant the best practice of laws for the commercial use of UAVs in Malaysia. Technology is indeed moving faster than the laws, thus for the betterment of society and the commercial growth of Malaysia in accepting this technology, the laws shall provide and define the rights and liabilities connected with the technology.

6.2 SUMMARY OF FINDINGS OF THE RESEARCH

Fundamentally, this research has been about analysing the ambiguous legal rights and implications of the use of commercial UAVs in Malaysia. The terms connected with UAVs must be highlighted in the laws and regulations especially when involving many types of business transactions which carry different terms and legal effects. The categorization of UAVs into classes of weight and purposes is a good step towards integrating the laws and providing uniform law as per the international standard of ICAO. The universal standard used by EASA in developing the UAV law in the European region offers a good model for Malaysia to follow in providing comprehensive regulation on commercial UAVs.

In brief, the researcher found several loopholes in-laws in addressing and testing the hypotheses. Firstly, the UAV legislation and regulation did not address the parties in the commercial UAV operation which consist of the owner, the pilot or operator and the manufacturer. This is important to highlight in the UAV regulations for a clear imposition of duties and liabilities in commercial UAVs. The liabilities of the owner, operator and manufacturer are not available in the regulations will create a lacuna if a tortious act is committed by those parties and thus there is no security to the public confidence. Secondly, the missing of navigable airspace for UAVs leads to the issue of aerial trespass over the proprietor's airspace and the issue of safety of manned aircraft. There were mixed administrations in the application of permits to use airspace for UAVs which created an obstacle to the commercial growth of commercial UAVs. The jurisdiction of the State and the Federal in dealing with commercial UAVs is not properly highlighted subsequently creating inconsistency in its operations. Thirdly, the right of way for UAVs is not declared in any legislation creating an obstacle to the

growth of the commercial UAV. The unutilized low-altitude airspace is yet to be declared as navigable airspace for UAVs will slow the development of commercial UAV operation. Fourthly, the loophole of law concerning the issue of low-altitude airspace not properly underlined in the regulations causes the issue of aerial trespass over the proprietor's airspace. The law does not provide the minimum altitude for the UAV to fly poses inconsistency in claiming the airspace with the proprietor. Fifthly, in dealing with vehicles, the unavailable infrastructure of highways for UAVs will dictate commercial growth due to the implication of trespass. Sixthly, the unavailable infrastructure of the right of way for UAV will open the available method to acquire airspace by granting a permit for easement however this method is limited for a certain duration of time. Seventh, the issues of risks and hazards connected with the operations of commercial UAVs are different. The inaccurate assessment of risks will pose the public with great danger.

Next is the liability of the operator or pilot for the commercial UAV not properly mentioned in the legislation will cause unattended negligence cases. Further, the liability of the UAV itself as an agent and alter ego of the owner and controller should be properly addressed to encounter the issue of accountability. Hence, the liability of the owner is not available in the legislation as to the application of the principle of strict liability caused unguaranteed safety precautions to the public. Next is the issue of registration of UAVs is unavailable in the regulations and will pose the issue of security. Moreover, none of the laws and regulations of UAV highlight the liability of the manufacturer which then causes the issue of airworthiness due to the breach of warranty by the manufacturer in failing to deliver good quality UAV in the Malaysian market.

Furthermore, the issue of nuisance from the operation of the UAV is not properly highlighted in the view of commercial operation which then annoys the public from the noise and vibration from the operation of the UAV. Next is the lacuna in the provision of registration of UAVs will cause a great danger to the security and safety of the public. Hence, the next infrastructure of UAV in terms of monitoring is not underlined in the legislation which then will create traffic in the use of airspace and the possibility of collusion. Lastly, the issue of insurance is not made compulsory for all types of UAVs creating uncertain protection for the public in case of accident and negligence by the commercial UAV. Figure 6.1 provides a list of loopholes in-laws for this research as follows:

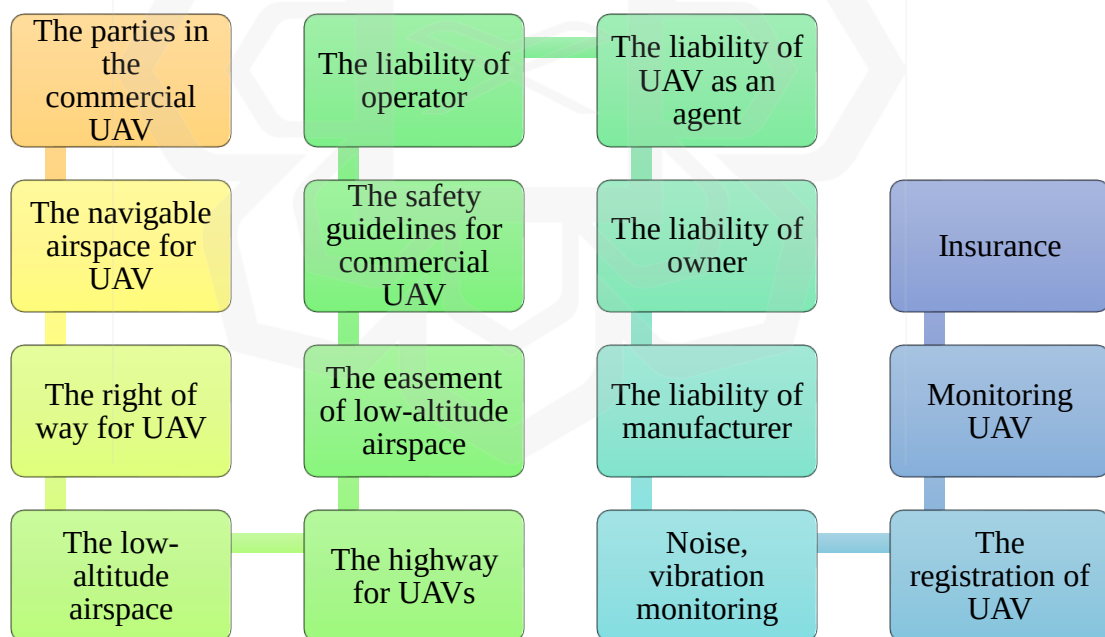


Figure 6.1 The loopholes of laws in the commercial UAV.

In brief, the integration of the CAAM, SIRIM, CGSO, MCMC and JUPEM will allow the smooth running of the system, particularly on the application of permits to fly UAVs as well as licence and certification for airworthiness and competency of pilots and operators. Although UAVs in the commercial arena are quite new in Malaysia, the cooperation by those agencies in the integration of regulations connected with commercial UAVs is indeed outstanding. However, to have a smooth running of the application for a permit to fly UAVs for commercial use should be under one roof to avoid the internal bureaucracy between the agencies. The procedures and steps on the application of permits and licences connected to commercial UAVs should be properly drafted to encourage all sectors of economics to utilize UAVs in full spectrum. Further, it is encouraged that the CAAM or even legislators provide a different set of regulations based on the purpose of commercial UAVs. Currently, only the agriculture sector has a complete set of directives specially designed by CAAM. This is considered a turning point for commercial UAVs to expand and soon other sectors will have their own set of directives to regulate commercial UAVs and protect the public from risks and dangers arising from the use of commercial UAVs.

Apart from that, the infrastructure of commercial UAVs especially the right of way and airspace of UAVs is another important area to be looked at to provide a smooth running of the UAVs. The right to low-altitude airspace is currently a controversial issue faced by commercial UAVs and the proprietors of land. The extent of ownership between those two certainly can be solved by segregating the airspace vertically. An altitude of 200 feet to 400 feet from the surface of the land is the appropriate lane for commercial UAVs despite the customary international law which sets the limitation of

500 feet from the surface of land as the minimum altitude of navigable airspace for manned aircraft and no other object including UAVs can encroach into this airspace. The provision in the Land Acquisition Act 1960 can be invoked by the CAAM to compulsorily acquire the proprietors' airspace in order to declare it as the navigable airspace for the UAVs provided adequate compensations are being paid to them. This declaration is important for the growth of commercial UAVs in Malaysia where the basic infrastructure of the right of way is guaranteed by the law and consequently may solve the issue of aerial trespass. This navigable airspace for UAVs shall be declared as one of the national economic plans so that the condition to compulsorily acquire airspace is according to the law as mentioned in the Land Acquisition Act 1960.

Further, it is suggested that if the commercial UAVs need to fly below 200 feet from the surface of the land and have to encroach into the private airspace of proprietors the best alternative method to legalise it is by applying a lease or even an easement with regards to the right of a pathway for the commercial UAV. This method can generate income for the proprietors as a consideration for the said permission. The lease and easement procedures and methods are contained in the national law and can further be expanded to the airspace as well. This is by virtue of the National Land Code of Malaysia which recognised the rights of the proprietor of land to include not only the sub-soil but also a reasonable column of the airspace.

Another infrastructure that needs to be developed in Malaysia for commercial UAVs is the drone port. The drone port can be one hub for all commercial UAVs in integrating the systems, air traffic and even the maintenance of UAVs. Moreover, apart from ATC's responsibility in managing the air traffic, the UTM developed by NASA will soon integrate the UAVs' air traffic system systematically.

Further, this research has analysed the importance of competency, skills and knowledge of the pilots and the operators of commercial UAVs. This is to ensure the liabilities spelt out in the commercial agreement between parties can be properly finalised. Further, there is a need for prompt checking of the airworthiness of the commercial UAV to ensure the safety of the public and avoid strict liability laws. Thus, the manufacturers also have a duty of care to provide safety by ensuring the commercial UAVs are flyable according to the standard approved by the CAAM, SIRIM as well as the ICAO. The issue of trespass however is still in a grey area as the line and zoning of UAVs' airspace are yet to be finalised by the CAAM. The discussion on the law of trespass in the earlier chapters is based on torts law, a concept borrowed from the common law. The existing guidelines for VLOS and BVLOS flights are the indicator to minimize trespass issues. It is safer for commercial UAVs to fly within the line of sight of the operator but this type of flight is not suitable for commercial UAVs defeats the purpose of commercialization and is unable to connect people remotely. As such, the BVLOS is the suitable flight mode for commercial UAVs. However, this type of flight is restricted and prior approval from the CAAM is needed. Moreover, for the nuisance issue, a community setting agreement is the best solution in order to have a mutual agreement between the community and society for the adaptation of UAVs in their neighbourhood. From an Islamic perspective, the use of UAVs in the commercial arena is considered permissible (*mubah*) as none from the *naskh* in al-Quran and sunnah prohibited such technology. The utilization of airspace at an altitude between 200 feet to 400 feet from the surface of the land is considered as reviving the dead land (*ihya' al-mawat*) because initially this altitude is considered unclaimed altitude, and the navigable airspace for manned aircraft is set at an altitude of 500 feet from the surface

of the land. Based on the *maqasid shariah*, the commercial UAVs could fall under *tahsiniah* but in a certain sector of the economy, the commercial UAVs can fall under *hajiyyah*. Furthermore, if commercial UAVs are well accepted by the community, the rule for the navigable airspace of the UAVs will reflect the concept of '*urf*'. Besides, this research has found out the importance of insurance arrangements in furtherance of the risk assessment with the paramount consideration to provide safety not only to the public but also to the property and the UAV itself.

Since the CAAM followed the EASA regulation on the categorization of UAVs according to the risks, the assessment of risks seems to be manageable but yet needs an improvement to specify the types of payloads that the UAVs carry out as well. The safety requirements shall be measured based on the airworthiness of the commercial UAVs and meet the minimum standard as required by the CAAM and SIRIM. This research further finds out that due to the broad diversity of commercial contracts that exist, the determination of duties and liabilities for the interested party in the commercial use of UAVs also vary according to the contract that they enter into. This research found out that since the usage of UAVs in the commercial arena is novel, it would most probably fall under the rules of strict liability considering if the UAV fall from the sky will cause damage to property, bodily injury or even death. It is also considered an abnormally dangerous activity renders it ruled as a strict liability by taking into account the weight of payload from the commercial sectors. This strict liability will be shifted to the normal negligence case in case of an accident when commercial UAVs become common in society. Apart from that, the issue of liability of the UAV as an agent to the master owner is determined by the registration of the UAV. We cannot impose liability on a non-human. By registration it is *prima facie* that the

UAV is acting as an alter ego for its master owner therefore master owner will be liable for the tortious act.

In summary, the researcher found answers when conducting this research where all hypotheses of this research were successfully tested, and the problems were answered with analogy and logical analysis based on the qualitative and legal methodologies as mentioned in chapter one. The finding of the first hypothesis is regarding the main infrastructure for UAVs of the right of way and use of airspace whereby the existing laws and regulations as provided in the National Land Code 1965, States' Land Rules, Land Acquisition Act 1960 and Federal Constitution sufficiently offer other alternative methods to segregate airspace for commercial UAVs, therefore, the commercial growth of UAVs in Malaysia can be realised.

The finding of the second hypothesis is regarding the implications of commercial UAVs where the duties and liabilities of an operator in the commercial UAV operation are contractual in nature, likewise the implication of commercial UAVs in tortious actions. Thus, the summary of further findings is as follows: -

1. The concepts and legal terms with respect to commercial UAVs can be integrated and understood if they are written well in the regulations and the laws (Chapter 2).
2. The integration of UAVs into one system can be realised once the low-altitude airspace is declared as navigable airspace which renders it as federal airspace. All matters enumerated in Item 10 (c) until (f) of the Federal List, Ninth Schedule of the Federal Constitution can be invoked to realise this mission. (Chapter 3)

3. The success of commercial UAVs is dependent on the efficiency of laws and mechanisms of all enforcement bodies in ensuring the safety and security of the public (Chapter 3)
4. Alternatively, the controversial airspace rights are manageable if the laws zone and segregate the airspace into vertical and horizontal accordingly (Chapter 4).
5. It is suggested that the right to airspace with respect to commercial UAVs can be set at an altitude of 200 feet to 400 feet from the surface of the land (Chapter 4).
6. The navigation airspace for manned aircraft remains at the minimum altitude of 500 feet from the surface of the land and is thus considered a restricted zone for commercial UAVs (Chapter 4).
7. The airspace below 200 feet from the surface of the land could be regarded as reserved airspace that belongs to the proprietor (Chapter 4).
8. The proprietors own reasonable airspace of land (Chapter 4).
9. It is essential to declare the navigable airspace for commercial UAVs to administer and monitor efficiently the operation of UAVs (Chapter 4).
10. The alternative method to acquire the low-altitude airspace is by invoking the provision under the Land Acquisition Act 1960, to compulsorily acquire the airspace for the right of way for commercial UAVs (Chapter 4).
11. The proprietors may grant an aviation permit, lease or easement to fly commercial UAVs which will boost new income and economy for the proprietors (Chapter 4).

12. The ATC soon will be integrated and expanded to the UAVs as well if Malaysia adopts the technology of UTM developed by NASA and can declare the low-altitude airspace as the navigable airspace for the UAVs. (Chapter 4).
13. Alternatively, the government may provide the drone port as one hub to monitor the safety and maintenance of commercial UAVs (Chapter 4).
14. BVLOS and VLOS flights are the standard safety guidelines for commercial UAVs to prevent commercial UAVs from encroaching on either private property or navigable airspace (Chapter 4).
15. The nuisance aspect *vis-à-vis* the commercial UAVs could be solved if the community adopt a standard community agreement for such technological advancement (Chapter 4).
16. The nuisance from noise and emissions from the operation of commercial UAVs shall be monitored by CAAM periodically. (Chapter 4)
17. The commercial UAV from an Islamic perspective highlights the concept of custom (*'urf*) where its customary practice and acceptance differed from one society to another society (Chapter 4).
18. So long as there is no indication of prohibition of commercial UAVs thus the *hukm* will remain *mubah* (Chapter 4).
19. The absolute ownership over the airspace belongs to Almighty Allah (swt) and a man who is the vicegerent of Allah only holds the land or airspace as a trust (Chapter 4).

20. The utilization of airspace at the altitude of 200 feet to 400 feet from the surface of the land for commercial UAVs is considered to revitalize the concept of *ihya al-mawat* (Chapter 4).
21. The pilots or operators of commercial UAVs are required to have knowledge and skills in flying the UAVs to show their competency and ability to execute and provide safety to the public (Chapter 5).
22. The owner and the operator or pilot of UAVs must provide safety to the public while operating the UAVs (Chapter 5).
23. The principle of strict liability applies to the manufacturer of UAVs to meet the standard of airworthiness (Chapter 5).
24. Carrying dangerous goods can be considered an abnormally dangerous activity and thus the principle of strict liability may be applied instead of the normal negligence claim (Chapter 5).
25. Accreditation by SIRIM for commercial UAVs is indeed an approved safety standard in Malaysia (Chapter 5).
26. The different categories of UAVs which are open, specific and certified are based on the types of risks (Chapter 5).
27. The assessment of risks is an indicator to avoid negligence by providing safety measures on, before and after the take-off and landing operation by the commercial UAVs (Chapter 5).
28. The duty of the manufacturer to deliver good quality UAVs is an important measure in assessing the airworthiness of the UAVs (Chapter 5)
29. The principle of strict liability is applicable for the manufacturer of UAVs if they sell a defective UAV which renders it to be airworthiness (Chapter 5).

30. The principle of breach of warranty is based on the contract between the manufacturer of UAVs and the end customer (Chapter 5).
31. The assessment of risks is essential for commercial UAVs at all times and the best method for the assessment of risk would be the SORA method (Chapter 5).
32. The issue of negligence can be reduced if the assessment of risks is properly conducted by the operator, pilot or owner as per the guidelines, before and after the take-off and landing (Chapter 5).
33. Insurance for commercial UAVs is measured based on the risk assessment conducted for the operation and it is also based on the skill, knowledge and competency of the pilot and the operator of the UAVs (Chapter 5).
34. It is suggested to make it compulsory for all types of UAVs irrespective of their weight to be registered and to confirm the ownership of the said vehicle. (Chapter 5)

In sum, the above findings are significant elements in the regulations of UAVs in the commercial arena which is summarised and illustrated in Figure 6.2, Figure 6.3 and Figure 6.4 as follows:

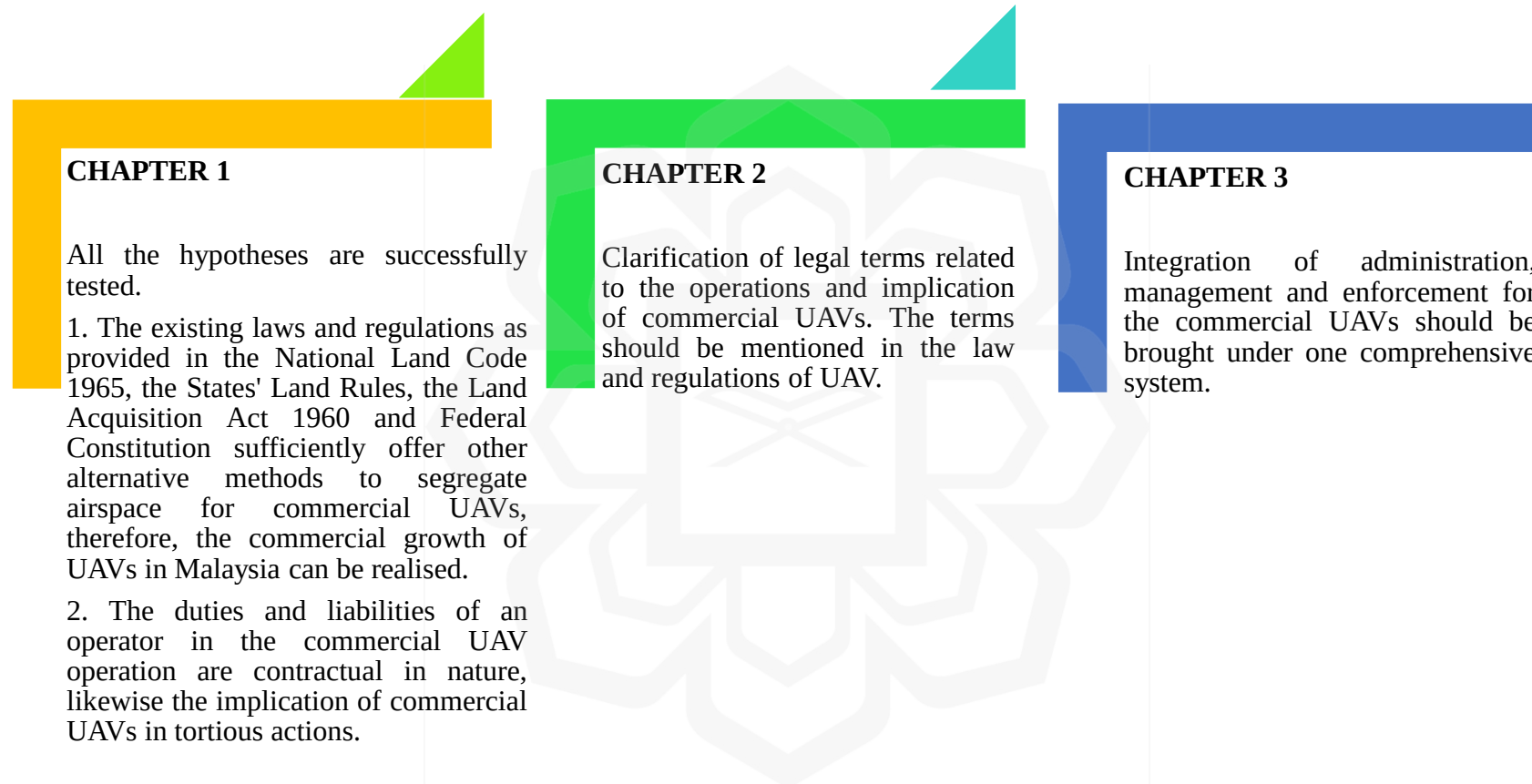
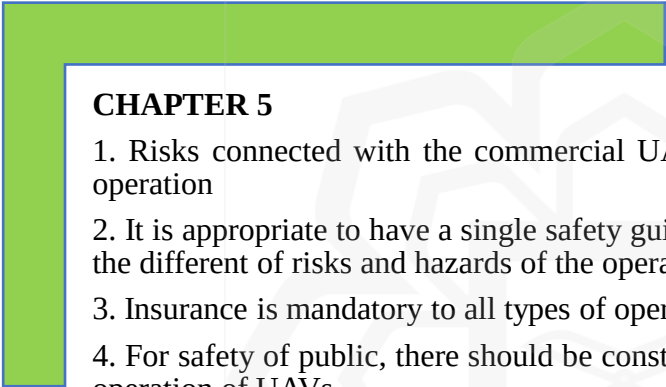


Figure 6.2 Summary of Findings of Chapter 1, Chapter 2 and Chapter 3.

CHAPTER 4

1. Declaration of low-altitude airspace at range 200 feet to 400 feet from the surface of the land as navigable airspace for the uavs is necessary so that the federal has jurisdiction in monitoring the airspace through ATC.
2. Declaration of commercial UAVs as the national economic plan make it possible for invoking provision for the compulsory airspace acquisition.
3. Integration with highway and railway companies by leasing the highway or the railway also can enhance the right of way and infrastructure for UAVs.
4. Alternative methods if the navigable low-altitude airspace hardly to realise, there are option for privilege trespass by invoking several deals in the National Land Code particularly leasing and easement
5. The manufacturer is strictly liable for the defective UAVs.
6. UAV is regarded under the limb of abnormally dangerous activity thus the principle of strict liability will be applied for tortious act committed during the operations.
7. The noise and emission from the operation commercial uavs should be monitored periodically by the CAAM
8. Other alternative methods to minimize nuisance is by signing an agreement and consent of community setting within the community.

Figure 6.3 Summary of Findings of Chapter 4.



CHAPTER 5

1. Risks connected with the commercial UAVs are different as according to the operation
2. It is appropriate to have a single safety guideline for single operation because of the different of risks and hazards of the operation
3. Insurance is mandatory to all types of operation
4. For safety of public, there should be constant patrolling and surveillance for the operation of UAVs
5. Assessment of risks by method of SORA to reduce negligence and accident

Figure 6.4 Summary of Findings of Chapter 5.

6.3 RECOMMENDATIONS

According to the above findings, the lacuna and loophole of laws as mentioned in Figure 6.1 expose commercial UAVs to various legal issues. The current law on UAVs is insufficient to address the demand of all sectors of economies for the usage of UAVs. The objective of UAV law is to offer safety and security measures in operating the UAVs from any claim of negligence, trespass or nuisance. There is still room to enhance the laws in tandem with the expansion of the commercial use of UAVs. The paramount objective in addressing these recommendations is to have a balance in providing justice in law for both commercial entities and the safety of the public.

Firstly, the researcher proposes that the UAV law especially the Civil Aviation Act of 1969, Civil Aviation Regulation of 2016 and all UAV's subsidiary legislations define comprehensively the parties of the commercial UAV which are; the pilot or the operator, the owner and the manufacturer. The rationale of having this provision is to clear any ambiguity of law with regard to the duties and liabilities of those parties to the public. The parties to the UAV as well will be informed and cautioned on their duties provided in the legislation.

Secondly, the researcher recommends the declaration of navigable airspace for UAVs which is considered as an essential infrastructure in the development of commercial UAVs. This is also to exercise the jurisdiction of the federal level as enumerated in the Federal Constitution. This declaration will create the comprehensive integration of administration in air traffic monitoring by ATC, thus upholding the objective of the Chicago Convention. The declaration of navigable airspace for UAVs will render the low-altitude airspace a public space under the control of the federal.

Thirdly, the researcher proposes the rights of way for UAVs, in case impossible to declare the navigable airspace for UAVs in the near future, the alternative method that the government can use is to declare the operation of UAV as the national economic plan. Then after, the government can invoke the provision on compulsory acquiring the low-altitude airspace which is under the ambit of the national economic plan. This is important to be highlighted in UAV law in which the ATC can monitor the operation of commercial UAVs promptly.

Fourthly concerning the low-altitude airspace, it is urgent to declare the minimum altitude airspace for UAVs at 200 feet from the surface of the land which can appropriately protect the proprietor's airspace from aerial trespass and nuisance. This is crucial as well to safeguard the operation of UAVs which will not encroach on the proprietor's airspace. The legislator may insert the phrase 'shall maintain a minimum altitude of 200 feet from the surface of the earth' in Regulation 140(1)(c) of the Civil Aviation Regulation of 2016.

Fifthly is regarding easement of the low-altitude airspace. Due to the process of amending laws on navigable airspace will take time in Parliament, it is appropriate to refer to the existing law which can offer the right of way for UAVs through the application of easement of airspace. This is considered an alternative method where the commercial entity can have an arrangement with the proprietor on the period of the aviation easement.

The Sixth is regarding the leasing of highways for UAVs. It is suggested that the commercial entities invoke the existing provision on leasing as provided in the National Land Code for the smooth running of the operation of UAVs without waiting

for the Parliament to declare the navigable airspace for the UAV. The existing highway or railway can be a blueprint for leasing the airspace for the UAV for a period of up to 3years.

The seventh concerns the safety guidelines for commercial UAVs which are currently under one directive which is Civil Aviation Directive 6011 Part (V)-Unmanned Aircraft System Special UAS Project. This directive is currently applicable for all types of operations other than agriculture. It is recommended that the legislator consider splitting this directive into several directives based on UAV operations due to the different risks and hazards of the operation. Therefore, the risk assessment can be calculated and monitored accordingly based on the operation of the UAV. It is inappropriate to apply one standard procedure to all types of operations because the needs of safety requirements also are different. This is crucial as the threat and hazard can be identified promptly according to the operation of UAVs thus can minimize the issue of accident and negligence. It is recommended to have one directive for one commercial UAV operation, for example; 1) shipping and delivery, 2) search and rescue, 3) marketing, 4) surveying and mapping, 5) entertainment, filming and videography, 6) journalism and news reporting, 7) monitoring, and 8) surveillance.

Eighth, the research suggests that the liability of operators of commercial UAVs should be mentioned in the legislation. The liability of the operator of commercial UAVs should be based on the types of contracts that the operator enters into. For example, in case of negligence, the law will impose strict liability on the operator of UAVs, however, if the commercial UAV's operator flies the UAV in capacity as an

employee, the principle of vicarious liability will be applied and not for the independent contractor's operator.

Ninth, the researcher proposes that the law and legislation mention the liability of a UAV as an agent to its master or controller. Therefore, the registration of UAVs is vital in tracking the ownership of the UAV. The UAV as a device and vehicle is an alter ego of the master or owner who has direct authority and command over the UAV. This is important to highlight due to the expansion of AI issues involving UAVs and to ensure the accountability of all interested parties involved in the operation of UAVs is addressed promptly in the legislation.

Tenth, it is suggested that the provision of liability of the owner should be mentioned in the legislation. The principle of strict liability should be addressed as one of duty for the owner to comply with the safety requirement over the tortious act committed during the operation. The punitive clause for non-compliance with the safety procedure should be introduced in the legislation and form a part owner's duty to act in accordance with the standard of care imposed and presumed by law. This is as a guarantee to the public that the owner will adhere to the safety procedure, laws and regulations with utmost care and attention.

Eleventh, the researcher proposes a new regulation or directive governing the liability of manufacturers should be introduced in Malaysian law. This is to highlight that the manufacturer also has a duty under contract to deliver a good quality product to the end customer. There are various types of operation of commercial UAVs which require a different specification based on the functionality of the operation. This is vital for the airworthiness of UAVs which then leads to the safety issue. A unique serial

number also is essential to be produced for the authentication of UAVs. The principle of strict liability also shall be applied to the manufacturer in case of tortious acts committed in connection with the defective UAV.

Next is regarding noise and vibration monitoring. As of now, this noise monitoring is not made compulsory in legislation. It is suggested that compulsory to monitor the level of noise from the operation of commercial UAVs which is considered acceptable to humans, animals and the environment. The periodical inspection and monitoring for at least every three months can be conducted by the officer of occupation, safety and health.

Next, the researcher proposes to make the registration of all types of UAVs regardless of their weight compulsory. The registration of UAV is a conclusive proof of ownership which is attached to the duties and responsibilities of the owner. The UAV law should introduce the requirement for the registration of commercial UAVs and UAVs should have their unique registration number similar to road vehicles where it should be displayed on the body of the vehicle.

Furthermore, in terms of monitoring the commercial UAV. It is essential to highlight the legislation the traffic monitoring for commercial UAVs for the safety of the public and other airspace users like helicopters and manned aircraft. The integration of air traffic monitoring for both manned and unmanned aircraft shows the integration of ATC to uphold the Chicago Conventions. The method of air traffic monitoring for commercial UAVs can be from ATC of CAAM, ATC from the Royal Air Force, Traffic monitoring from Toll Concession in case of leasing of airspace and lastly from the Royal Police Malaysia.

Lastly is the provision of insurance. It is suggested to make insurance compulsory for all commercial UAV operations. This is to ensure the UAV and commercial UAV operation is insurable for any foreseeability of risks, injury of person and damage to property of the public. The method of insurance can be; 1) the first party insurance, 2) the third-party insurance, and 3) the pay-as-you fly. This is a type of security that boosts public confidence in commercial UAVs for the uncertain hazards and risks of the operation of UAVs. Table 6.1 provides a summary of the recommendations and suggestions for the improvement of existing laws on the commercial use of UAVs, as follows:

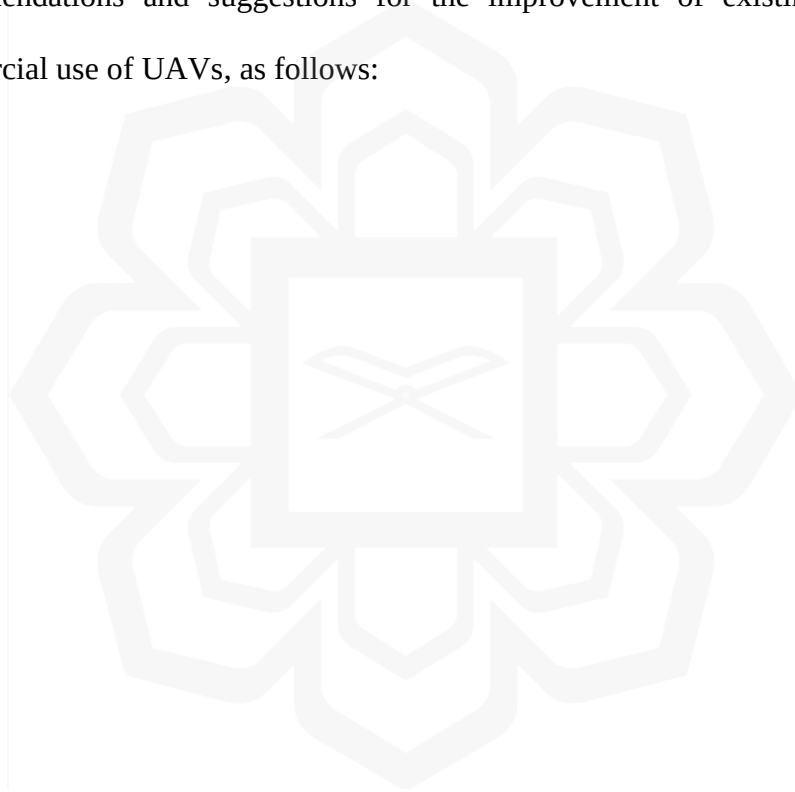


Table 6.1 The Recommendations for the Commercial Use of UAVs Law and Regulation.

	Lacuna	Proposal/Amendment	Rational	Legislations/ Regulations/ Directives affected
A	The parties in the commercial UAV operation	To define in the legislation regulation or the CAAM directives, the parties of the commercial use of UAVs; which consist of:- i. Pilot of UAVs; ii. Operator of UAVs; iii. Owner of UAVs; iv. Manufacturer of UAVs.	i. This will clear the ambiguity of the law consequently the parties will not escape from liability. ii. The parties in the commercial UAVs will be informed and cautious about their duties towards the public and thus will fly the UAV prudently.	i. Civil Aviation Act 1969. ii. Civil Aviation Regulation 2016. iii. All the subsidiary legislations of the Civil Aviation Act 1969 including the CAAM's directives.
B	The navigable airspace for UAV	To declare the low-altitude airspace as navigable airspace. To exercise jurisdiction and matter enumerated for federal	i. The integration of administration and enforcement of UAVs in one system at the federal level, therefore, the ATC can monitor both manned and unmanned	i. Civil Aviation Act 1969.

		level in the Ninth Schedule of the Federal Constitution.	aircraft for the safety of the airway. ii. To uphold the ICAO pledge and the Chicago Convention to provide safety and integration of both manned and unmanned aircraft. iii. Navigable airspace is public airspace thus it is a jurisdiction of Federal matters.	ii. Federal Constitution (Malaysia).
C	The right of way for the UAV	To declare the commercial UAV as one of the national economic plans. Thus, the government can invoke the provision on compulsory acquiring the low-altitude airspace within the ambit of the national economic plan.	i. To have an infrastructure right of way for commercial UAVs. ii. Can enforce the law effectively when the issue of the right of way is concluded. iii. The ATC can monitor the commercial UAV promptly.	i. Land Acquisition Act 1960. ii. Federal Constitution (Malaysia).
D	The low-altitude airspace	To declare the minimum altitude of airspace for the UAVs at 200 feet from the surface of the land. To insert the following phrase:	i. To safeguard the operation of commercial UAVs not to invade the private airspace of the proprietor.	Regulation 140(1)(c) of the Civil Aviation Regulation 2016.

		Regulation 140(1) (c); No person shall fly an unmanned aircraft: (c) at a height more than 400feet above the surface of the earth <i>and shall maintain a minimum altitude of 200 feet from the surface of the earth.</i>	ii. To protect the proprietor's airspace. iii. Minimizing the issue of aerial trespass and nuisance.	
E	The highway for the UAVs	To lease airspace above the highway or railway for the smooth-running operation of the commercial UAV without encroaching on private airspace.	i. The blueprint of the existing highways shows the connection of routes which are important for the economic chain. ii. Minimize the issue of trespass and nuisance. iii. Minimize risk and hazard iv. Toll concessions can gain profit from leasing their airspace. v. Monitoring the UAV operation through the existing traffic management of the concession's companies.	National Land Code 1965.

F	The easement of low-altitude airspace	To commercialise the UAVs by granting a permit to use the airspace within the agreed duration between the operator of UAVs and the proprietor.	i. The alternative method for the operator of UAVs is to get a privilege trespass from the proprietor based on the agreement for the specified period. ii. Minimize the issue of aerial trespass and nuisance. iii. Minimize risks and hazards. iv. This deal is secured and certain as it shall be registered to the land registry. v. The proprietor may gain profit by granting the easement to the commercial UAVs.	National Land Code 1965.
G	The safety guidelines for commercial UAV	To introduce independent safety guidelines based on the operations of the UAV and not by the category of UAVs that the Directives have now. To split the directives into the following: - i. Civil Aviation Directives-UAV for	i. Specific hazards and threats can be identified promptly according to the operation of the UAVs. ii. Risk assessment can be calculated and monitored accordingly. iii. Minimize the liability of operators and pilots of UAVs in	Civil Aviation Directive 6011 Part (V)– Unmanned Aircraft System Special UAS Project- (CAD 6011 Part (V) – UAS SUP).

		- shipping & delivery services ii. Civil Aviation Directives-UAV for search and rescue iii. Civil Aviation Directives- UAV for marketing iv. Civil Aviation Directives- UAV for surveying and mapping v. Civil Aviation Directives- UAV for entertainment, filming and videography vi. Civil Aviation Directives- UAV for journalism and news reporting vii. Civil Aviation Directives- UAV for monitoring viii. Civil Aviation Directives- UAV for surveillance	case of negligence when there is comprehensive safety procedures are provided by the law.	
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H	The liability of an operator	To have a punitive clause the liability shall be based on the types of contract or agreement that the operator enters into. For example, in case of negligence, where the operator or pilot is the following persona, thus the principle of the following shall apply: i. Employee: vicarious liability ii. Independent operator: strict liability or negligence* iii. Agency: strict liability or negligence* <i>*Note: Strict liability may not apply when UAV operation becomes widespread and common in Malaysia; instead, the principle of ordinary negligence will prevail.</i>	To have a clear rule on types of liability in torts since many torts' principles are not mentioned in the legislation.	i. The CAAM Civil Aviation Directives. ii. The respective contract between the parties.
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I	The liability of UAV as an agent	To make registration of all UAVs compulsory. The UAV is an <i>alter ego</i> of the master or owner, who has direct authority and command over the UAV. In this case, strict liability will be enforced on the master or owner of the UAV.	Ensure accountability of all interested parties involved in the commercial use of UAVs is mentioned in the regulations. To have a certain and uniform law on artificial intelligence (AI) issues involving UAVs is addressed promptly.	i. Civil Aviation Act 1969. ii. Civil Aviation Regulation 2016. iii. All the subsidiary legislations of the Civil Aviation Act 1969 including the CAAM's directives.
J	The liability of an owner	To have a punitive clause for non-compliance with rules. The principle of strict liability will apply to the owner of the UAV for the tortious act committed during the operation. <i>Note: Strict liability may not apply when UAV operation becomes widespread and</i>	To guarantee that the owner of UAVs adheres to strict compliance where the standard of care is given the utmost consideration.	The CAAM Civil Aviation Directives.

		<i>common in Malaysia; instead, the principle of ordinary negligence will prevail.</i>		
K	The liability of a manufacturer	To introduce new guidelines or to insert the provision on the liability of the manufacturer of UAVs to deliver good quality UAVs as per the specification of laws. To list down the specifications of UAVs for the requirements of airworthiness: i. Status of UAVs ii. Types of UAVs iii. Engine iv. Propeller v. Design To ensure UAVs have a unique serial number	i. Airworthiness of UAVs depends on the number of aspects and components of UAVs which relate to the acceptable physical state of the UAVs. This is to uphold the international standard practice as per ICAO Annex 8. ii. The principle of strict liability and breach of the warranty will be enforced on the manufacturers of UAVs if they deliver defective UAVs iii. To protect manufacturers from liability in tort in case of modification of UAVs which are not according to the specification of law and airworthiness.	None of the law is affected. CAAM need to introduce new guidelines for the manufacturer of UAVs.
L	Noise, Vibration monitoring	To suggest a compulsory periodical inspection on noise level measurement for all commercial UAVs.	This is to ensure that the degree and the level of disruption from the noise of commercial UAV propellers are acceptable to humans, animals, and the environment for safe operation.	i. Civil Aviation Directive 6011 Part (II) – Unmanned Aircraft System Agricultural

		It is suggested to monitor the level of noise every three months.		UAS Operations –(CAD 6011 Part (II)– UAS AGR). ii. Civil Aviation Directive 6011 Part (V)– Unmanned Aircraft System Special UAS Project- (CAD 6011 Part (V) – UAS SUP).
M	The registration of UAV	To insert provision on registration of UAVs which affects all types of UAVs irrespective of their weight. To provide a unique registration number for UAV and compulsory to display on the body of the UAV.	Registration of a UAV is a conclusive proof of ownership that is attached to the duties and liabilities.	Civil Aviation Regulation 2016.
N	Monitoring UAV	To monitor traffic for commercial UAVs. it is suggested to monitor according to the following methods:	There shall be comprehensive surveillance for the safety of all parties from the ground, the sea and the airspace.	Civil Aviation Act 1969.

		i. ATC of the CAAM, ii. ATC of the Royal Air Force, iii. Traffic Monitoring from the Toll concessions, iv. Royal Police Malaysia.	The integration of ATC for UAVs upholds the ICAO pledge to integrate safety for both manned and unmanned aircraft.	
O	Insurance	To make insurance compulsory for all commercial operation of UAVs. Methods of insurance will be based on the types of operation and categories of UAVs. Propose method of insurance:- i. The first-party insurance, ii. The third-party insurance, iii. The 'pay-as-you-fly' method.	To protect future risks and uncertainty of injury and damage to person and property.	i. Civil Aviation Act 1969. ii. Civil Aviation Regulation 2016. iii. All the subsidiary legislations of the Civil Aviation Act 1969 including the CAAM's directives.

6.4 IMPLICATIONS AND SIGNIFICANCE OF THE RESEARCH

The significance of this research to Malaysia indeed will change the topography of the low-altitude airspace that in future will be utilized commercially like manned aircraft. Currently, the low-altitude airspace is considered lawless which sits in between of proprietor's ownership with the navigable airspace. The untouched low-altitude airspace will be utilized to the maximum with the introduction of commercial UAVs. Therefore, the integration of ATC managed by the CAAM in future will include the low altitude airspace as well as the commercial UAVs in line with the objective of the ICAO in integrating laws and regulations for both manned aircraft and unmanned aircraft. However, as of now the execution and enforcement in relation to "the airspace" control is still a vague area. Although the terms of maintenance and airworthiness of the commercial UAV shall be similar to the manned aircraft as provided by the Chicago Convention, the hardest part is to manage and control the airspace due to the increasing number of UAVs flying and utilizing the low-altitude airspace. The only solutions that may be workable are by defining and designing the low-altitude airspace for commercial UAVs only and shall exclude the private use and recreational use of UAVs.

Moreover, for the successful introduction of commercial UAVs in Malaysia, the laws also shall be ready to walk side by side with this technology by providing special rules for the private use and recreational use of UAVs to segregate the airspace of commercial UAVs. If this mechanism is not properly designed, it will create confusion in relation to the usage of airspace. Another important issue relates to the authorization, permit and licence for the utilization of low-altitude airspace. Analogically just like public roads are designed for registered motor vehicles and competent drivers, the road traffic must be adhered to by them. The prohibition of electric scooters on public roads can set an analogy with private UAVs flying in low-altitude airspace which neither have

a licence nor have a permit. In sum, the segregation of airspace vertically and horizontally will pave the way for the success of commercial UAVs in Malaysia.

The owner, the operator or pilot of UAVs and the manufacturer are the main parties in determining the limitation of rights and liabilities to the third party in case injury or loss and other tortious acts occur while operating the UAVs. The connection of liabilities and rights of the parties in commercial UAVs depends on the types of the commercial agreement be it agency, employment or lease and rent. The issue of liability further leads to the development of insurance to cover the risks that arise from the use of commercial UAVs resulting in injuries to individuals or damaged property. By having commercial UAVs in Malaysia, the insurance sector will grow to provide the mechanism for protecting and covering the liability of the owner, the pilot and the operator as well as the manufacturer, for possible injury or damage suffered while operating the UAVs.

6.5 ISSUES FOR FURTHER RESEARCH AND POLICY DEVELOPMENT

The growth of commercial UAVs will have an impact on the further growth of UAVs' infrastructures thus the placement of the drone port shall be properly managed to enable the extensive usage of commercial UAVs in Malaysia. Surely, the arrangement and the placement of 'Drone Port' will lead to the compulsory acquisition of land and transfer of land from the registered proprietor to the developer of 'Drone Port'. The legal issue will arise on the utilization of low-altitude airspace that is connected with the ownership of a registered proprietor. The accuracy of the maximum and minimum altitude of airspace shall be mentioned in the Act to cope with the ambiguity in defining the altitude line of the proprietor's airspace and the UAVs' airspace. The low-altitude airspace thus

in future will be utilized commercially by UAVs due to the demand for this technology in Malaysia and worldwide. Later in the next ten years, the essential use of commercial UAVs will reflect the usage of telecommunication and the internet nowadays. The development of land law indeed will be expanded to the utilization of airspace and not limited to the surface of the land. The easement of airspace and the lease of airspace will be the common ways to legalize the commercial use of low-altitude airspace by UAVs. Certainly, despite the acquisition of land by transfer, these two methods are considered the alternative ways to the rapid growth of commercial UAVs in Malaysia without waiting for the long managerial and technical process of transfer of land.

The further legal issue that is still open for discussion in commercial UAVs is privacy matter which can be divided into physical privacy and digital privacy. Physical privacy is usually connected with the constitutional right of an individual to freedom of movement and the right to life. The concept of surveillance by the camera attached to the UAVs surely raises the constitutional issue of privacy. Thus, to cope with this legal issue, commercial UAVs shall be ready to provide assurance and protection to the public on this issue. However, the discussion on digital privacy is interrelated to the personal data privacy that is already covered by the Personal Data Privacy Act 2010.

Furthermore, law enforcement monitoring by UAV is a novel problem that demands extensive research into its legality and impact on the public. The concept of UAV surveillance is an extension of the role of people patrolling and closed-circuit television (CCTV) monitoring. The debate about these UAVs is linked to the limitations of UAVs, which can be regarded in terms of freedom of movement as well as privacy concerns.

6.6 THE WAY FORWARD

I believe that the success of the commercial UAV in Malaysia is due to the introduction of UAVs in delivery and logistics which will create a big impact on the mechanism of society in adapting the commercial UAV. Thus, the CAAM shall be ready to draft the guidelines and directives specifically designed for UAV delivery despite using the Special UAV Directive which applies to all types of commercial operations. The impact of the introduction of special laws for UAV delivery will create a big opportunity for the logistics company in introducing this technology to society and further will impact the sustainability of Malaysia's economy.

As a part of that, the agriculture UAVs are seen as the new apparatus which is likely to succeed as the CAAM has provided the tools in directives as a guideline for the agriculture UAVs. The agriculture sector was chosen by the CAAM in developing the special directive for agriculture due to the demand for this technology in Malaysia for efficiency in farming management despite reduced labour in agriculture. This is considered a stepping stone for commercial UAVs in Malaysia to be accepted and developed by society and later will become the customary practice in the commercial arena.

Further, the major success is when the law declares the low-altitude airspace as navigable airspace which is considered as the significant infrastructure in the industry and for monitoring the UAV for the safety of the airway and the public. The other infrastructures for commercial UAVs such as drone port and ATC must be provided by the relevant authority to have proper management of the system, especially in zoning the airspace by altitude horizontally and vertically and it should be published to all pilots and operators on such rules.

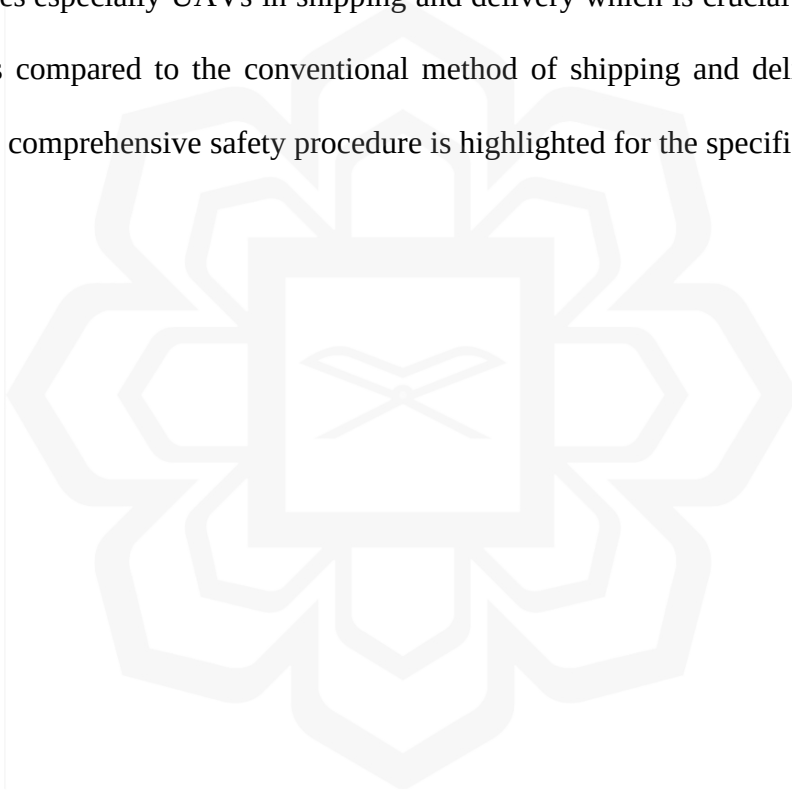
6.7 CONCLUDING REMARKS

To summarise, certainly, this research will certainly and significantly contribute to Malaysia's new mechanism for integrating UAV technology in the commercial arena, particularly in dealing with the ambiguity of legal concerns stemming from the use of UAVs. Furthermore, given the methodologies indicated by the researcher in Chapter 4, this research may assist the CAAM in defining navigable airspace for UAVs. Aside from that, a concession from the owner in leasing the airspace or granting an easement will be a terrific deal for commercial UAVs to invest in.

Although the existence of UAVs in the commercial arena is considered novel in Malaysia, the efficiency of CAAM in upholding the mandate of international aviation of ICAO and the Chicago Convention is remarkably outstanding in integrating both manned aircraft and unmanned aircraft into one integrated system of ATC under one national navigable airspace. Malaysia could adopt EU UAV laws since it has extensive security and safety measures implemented for all types of UAVs. As of now, the CAAM has introduced two directives that were designed specifically for commercial UAVs; the Agriculture UAV Directives and the Special Use UAV Directive. This is considered an achievement and recognition of commercial UAVs in Malaysia. These two directives show Malaysia's commitment to integrating and welcoming commercial UAVs in the utilization of low-altitude airspace.

Nevertheless, in terms of practice, Malaysia can observe and learn from the rapid development of UAVs in the United States in an attempt to trial and error their regulations to strike a balance between this technology and the public, even though they have yet to declare the low-altitude airspace as navigable airspace. As of now no country in the world has proclaimed UAV low-altitude airspace to be navigable. Furthermore, it is widely assumed that, due to Malaysia's federalism structure, the declaration of low-

altitude airspace as navigable airspace could be realised. Malaysia might be the first country to undertake this step. More progress should be made to strike a balance between commercial and public-interest UAVs. Commercial UAVs become the stepping stone in the development of UAV laws and regulations due to the increasing demand of corporations to use UAVs in their commercial context. Hopefully, in future, there will be more guidelines and directives for various types of commercial UAV operations because the different operation requires different approaches and safety guidelines especially UAVs in shipping and delivery which is crucial in the economic chain as compared to the conventional method of shipping and delivery. This is to ensure a comprehensive safety procedure is highlighted for the specific operation.



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