# Electric Aviation, Battery Technologies and the Emerging Legal Landscape

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A Beyond Horizons
White Paper
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# ABSTRACT

This white paper provides a comprehensive analysis of sustainable practices in the aviation industry with a focus on Asia. It highlights the transformative potential of electrification in aviation and the advancements in battery technologies essential for this shift. Through examples, such as the electrification of aircraft in Indonesia's archipelago and the advancements by Flint Technologies in developing non-toxic, compostable batteries, the paper underscores the urgent need for sustainable development in aviation. It also explores the potential of eVTOLs (Electric Vertical Take-off and Landing aircraft) in urban environments, the financing challenges they face, and the necessity for a circular battery economy to ensure sustainability.

A significant part of the discussion centres on the challenges and opportunities related to battery recycling versus reusing, utilising collaborative case studies to illustrate optimal paths forward. The paper includes key legal considerations to address practical issues, with a focus on policies and taxonomies that support sustainable aviation growth. Notably, the ASEAN Taxonomy for Sustainable Finance and Singapore's innovative use of carbon credits are discussed as frameworks for facilitating the adoption of electric aircraft.

Overall, the paper aims to provide insights into the future of aviation, emphasizing the critical need for alternative energy sources and sustainable practices in response to the depleting resources and increasing environmental concerns.

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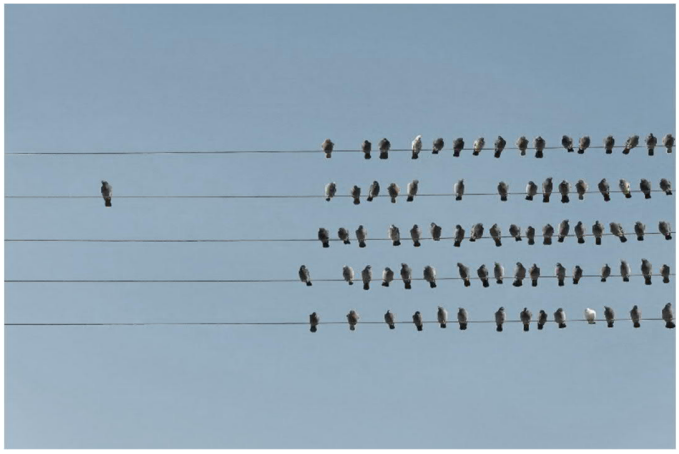

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# PART 1: ELECTRIFICATION OF THE AVIATION INDUSTRY

## Introduction – A Path to Electrification

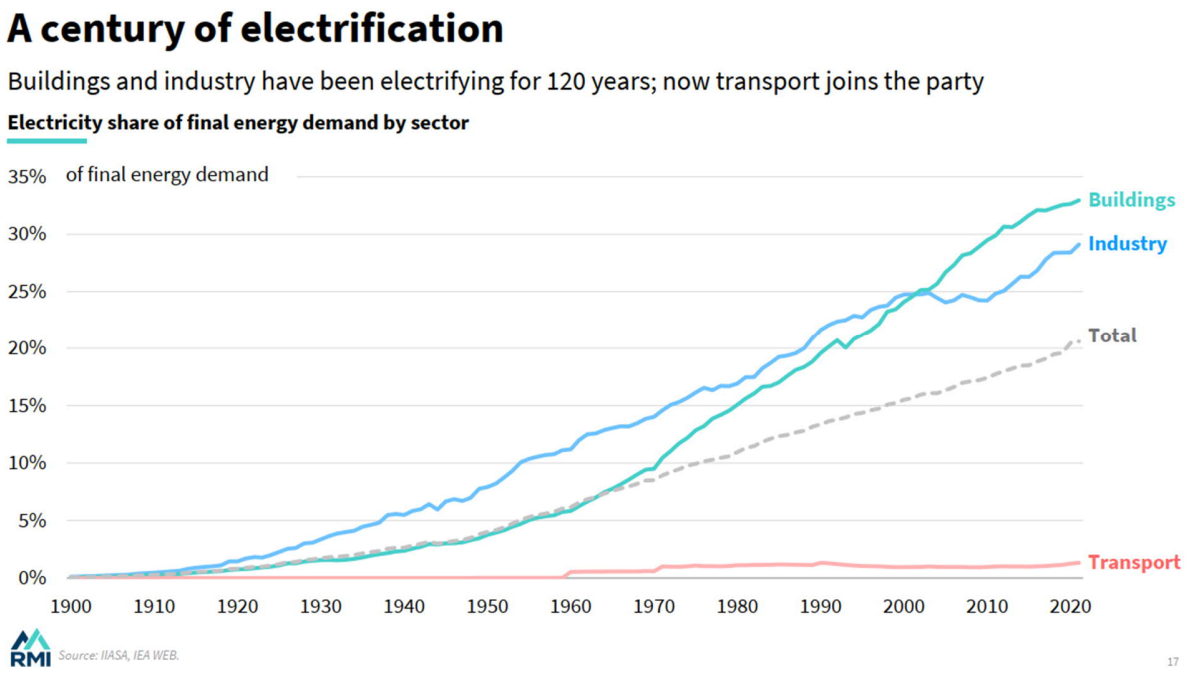
Throughout history, industrial revolutions have acted as powerful catalysts, spurred economic growth and technological advancements, while also enhancing the quality of life. Many of these revolutions increased efficiency without much focus on preserving resources. The priority was maximising production and meeting the population demand. However, with our current world's depleting resources and increasing global temperature, there has been concerted effort to shift towards more sustainable practices.

While buildings and industry have been electrifying for 120 years, the story of electrification of transportation is only beginning, with land transport being the first segment to be disrupted. Despite aviation contributing only 2.5-3% of global CO2 emissions, there is a recognised need to reduce emissions and embark on a decarbonisation roadmap comprising several policy and technology measures. Flygskam (flight-shaming) has taken off, airlines have seen a spade of anti-"greenwashing" litigation[1] and France's short-haul flight ban[2] where a rail alternative under 2.5 hours exists has produced an encouraging decrease in overall emissions in 2023 compared to 2022 whereas such emissions have increased on an international level. With Asia's archipelagic geography, the development of rail connectivity has been largely domestic (for example the first Indonesian high speed rail route between Jakarta and Bandung) or across land masses (for example the Belt and Road Initiative's China – Laos railway). Air connectivity remains a necessary means to drive inclusive economic growth in Asia[3], with less developed cities and towns being having the most to benefit from the construction of new airports.

[1] https://www.cnbc.com/2022/05/24/climate-airline-giant-klm-to-face-legal-action-over-greenwashing.html

[2] https://www.euronews.com/green/2024/07/06/frances-short-haul-flight-ban-one-year-on-has-it-encouraged-more-people-to-take-the-train

[3] https://hass.sutd.edu.sg/news-events/event/news-hass/economies-take-off-with-new-airports-research-shows-positive-impacts-of-airport-investments/




*Source: RMI (2024), The Cleantech Revolution PowerPoint Presentation*

While sustainable aviation fuel is the nearest-term decarbonisation solution for the existing aviation sector, studies have shown that small electric aircraft allowing connectivity for currently under-connected locations can also have a notably lower climate impact[4] compared with fossil fuelled aircraft, although there is a trade-off regarding mineral resource scarcity in the batteries. Despite this trade-off, electric aviation is highly likely to lead sustainable aviation with zero-operating emission electric aircraft and eVTOLs.

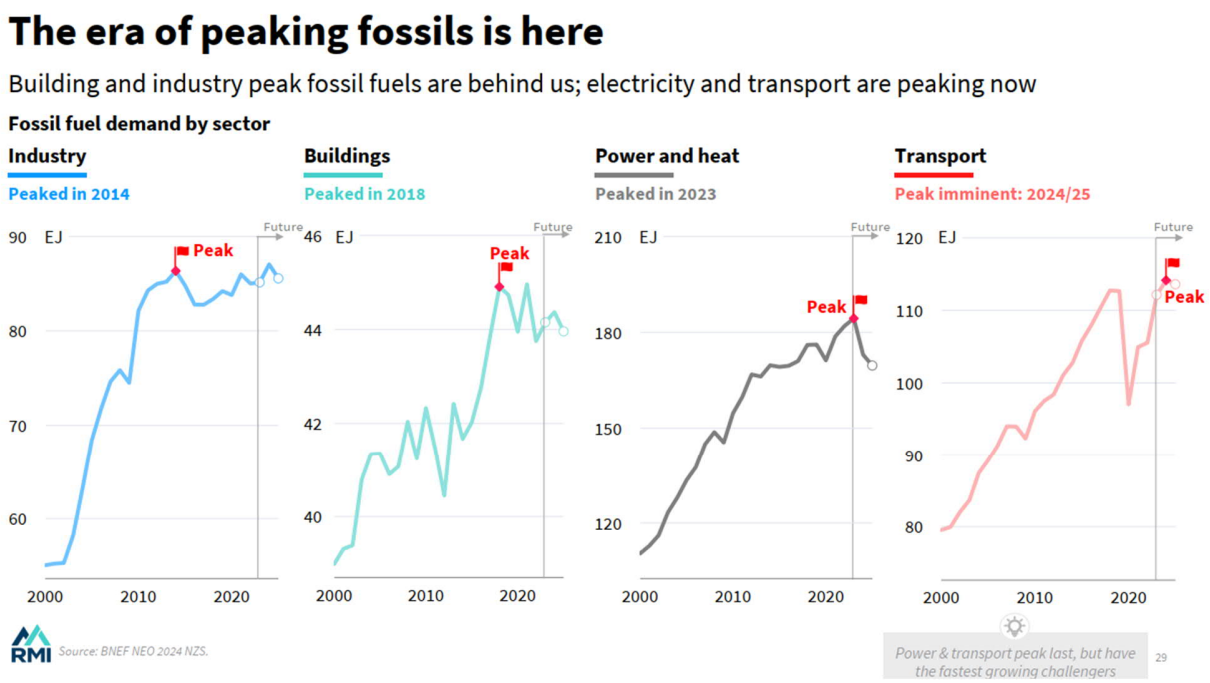
## Use-case Spotlight: Indonesia

While still in its early stages of development, significant progress has been to electrify planes. Current electric planes are capable of short-range flights and recreational flying. Trial flights to expand capabilities are already underway. This paper expects the gradual adoption of electric and hybrid-electric aircraft for short-haul, regional flights and air taxi services to become commonplace within by the end of the decade.

One such use case may be island hopping in countries like Indonesia. Indonesia's vast archipelago of over 17,000 islands faces unique challenges in terms of connectivity

[4] https://www.sciencedaily.com/releases/2024/01/240123122145.htm

and transportation. Traditional modes of transport that include boats and conventional aircraft, often struggle with inefficiencies such as lack of infrastructure, lack of deep harbours, high costs, and significant environmental impacts. The adoption of electric aircraft presents a promising solution to improve remote island connectivity in a sustainable manner. Facilitating faster travel will boost local revenue by providing incentives for tourists and locals to visit these remote islands which were previously inconvenient to access. Improved connectivity and traction would also facilitate business operation and trade. Electric planes generally have lower operating and maintenance costs compared to conventional aircraft and ships, due to fewer moving parts and simpler propulsion systems. These factors can translate into savings for operators and more affordable fares for passengers.




*Source: RMI (2024), The Cleantech Revolution PowerPoint Presentation*

## Fly BLADE India on India's Air Connectivity

Air connectivity in India has come a long way with India being one of the leaders in commercial aviation growth measured based on new orders placed for aircraft and traffic through India's airports. This growth needs to be supported with last mile connections from main cities to smaller towns that depend on long road journeys. While the government is making significant strides in the development of national

highways, the high volume of cars has led to increased congestion, affecting productivity, hindering socio-economic development through lack of available productive man hours and deters tourism due to prolonged time spent on the road. Bangalore and Mumbai rank among the most congested cities in the world. India has more than 1,500 identified tourist locations. Nearly 10% of those destinations are located far away from the nearest airport, requiring more than eight hours of driving. Helicopters which are currently being deployed but remain a capital-intensive business activity.

Aircraft acquisition, its operation, maintenance, repair and operations and infrastructure require large initial investments. There about 250 helicopters currently registered in India, which is lower than the number of helicopters in western nations, presenting a significant opportunity for eVTOLs in the country. Lower operational costs will make the eVTOL journeys more affordable for last mile connections from busy airports to city centres and less served destinations, taking some pressure off already crowded roads. The economical nature of eVTOLs would encourage more people who found helicopter costs to be prohibitive to change their habits and adopt a new mode of travel.

## The Future of Batteries: An Insight into Flint's Paper Battery Technology

While there are several advantages to remote island connectivity, battery limitations are preventing the proliferation of electric aircraft. Energy densities of current batteries are small, limiting the aircraft to only a smaller flight distance with a smaller passenger, crew and cargo load. There are also range and payload limitations even though battery costs have been democratised over the years, making batteries cheaper. One might argue that it is prudent to delay the advancement of electric flight until present battery technologies are improved. This paper, in a conversation with Carlo Charles, Co-Founder, Product & Innovation Head of Flint Technologies Singapore, disputes this notion.

Charles explained that Flint is developing a new paper battery system that works exactly like a lithium battery but using natural non-toxic and compostable materials. Paper batteries are resistant to overheating and explosion risks. Their batteries also avoid resource depletion (which poses an issue for traditional Li batteries) and are recyclable. Charles further explains that because Flint's batteries are flexible, the batteries can be moulded to, for instance, to the curvature of the wing of the plane or

the airframe, which increases the surface area and volume of the battery, thereby enhancing its density. Emerging technologies in battery technology continue to present new opportunities for the electrification of aviation.

## Use-case Spotlight: Zipline Technologies

Another subdivision of the aviation sector reliant on battery technology is electric drones. From flight time to overall efficiency, drones depend heavily on battery capabilities. Recent advancements allow longer flight times and quicker turnaround with reduced charging intervals, benefiting both commercial and recreational drones. Their flexibility in use case scenarios, from monitoring traffic to home package deliveries, is enhanced by improved battery technologies, making operations pollution-free.

Zipline Technologies exemplifies this, using drones not just for urban home deliveries, but also for rural medical transport such as for delivering HIV/AIDS medication in western Kenya and snakebite anti-venom to Ghanaians.

Zipline's fixed-wing drones, with a 10ft wingspan, carry up to 1.75kg of cargo. The drones or "Zips" utilise advanced route planning capability. The algorithms can work on large datasets, including factors like weather conditions and airspace restrictions, and determine the best flight path to take. This enables their drones to make deliveries in thirty minutes or less, thereby ensuring timely access to life saving supplies. The medical drone delivery company is expected to start its expedition in its first Asian city, Japan, revolutionising accessible healthcare across the Goto Islands, and potentially across Asia in the coming future.

# PART 2: EVTOLS AND BATTERY RECYCLING

## Advanced Air Mobility and eVTOLs

As established above, there is a case for the electrification of aircraft and new battery technologies are in sight. However, the reality of flying electric vehicles is that they still rely heavily on traditional lithium-ion batteries partly due to the familiarity of existing technology allowing batteries to be certifiable. Advanced air mobility is expected to grow to a $1 trillion market revolutionising mobility options and experiences in cities. By the end of 2023, $8.5 billion has been invested into the sector, and eVTOLs are targeting an entry-into-service by 2025/2026. As such, this section discusses the market expansion of eVTOLs, financing eVTOLs, battery recycling and the hurdles surrounding the uptake of eVTOLs.

EVTOLs are well-positioned to lead electric aviation and the roadmap for sustainable aviation. As part of the broader push towards reducing carbon emissions and enhancing urban air mobility, eVTOLs will be battery-electric, 100 times safer than a helicopter (SC-VTOL) with distributed electric propulsion, significantly quieter, and have 50% less direct operating costs compared to conventional helicopters. EVTOLs are designed to combine the vertical take-off and landing capabilities of helicopters with the safer and more efficient, forward flight characteristics of fixed-wing aircraft. EVTOLS are quieter, produce zero emissions during operation, and do not require a runway for take-off and landing, making them more suited for urban environments.

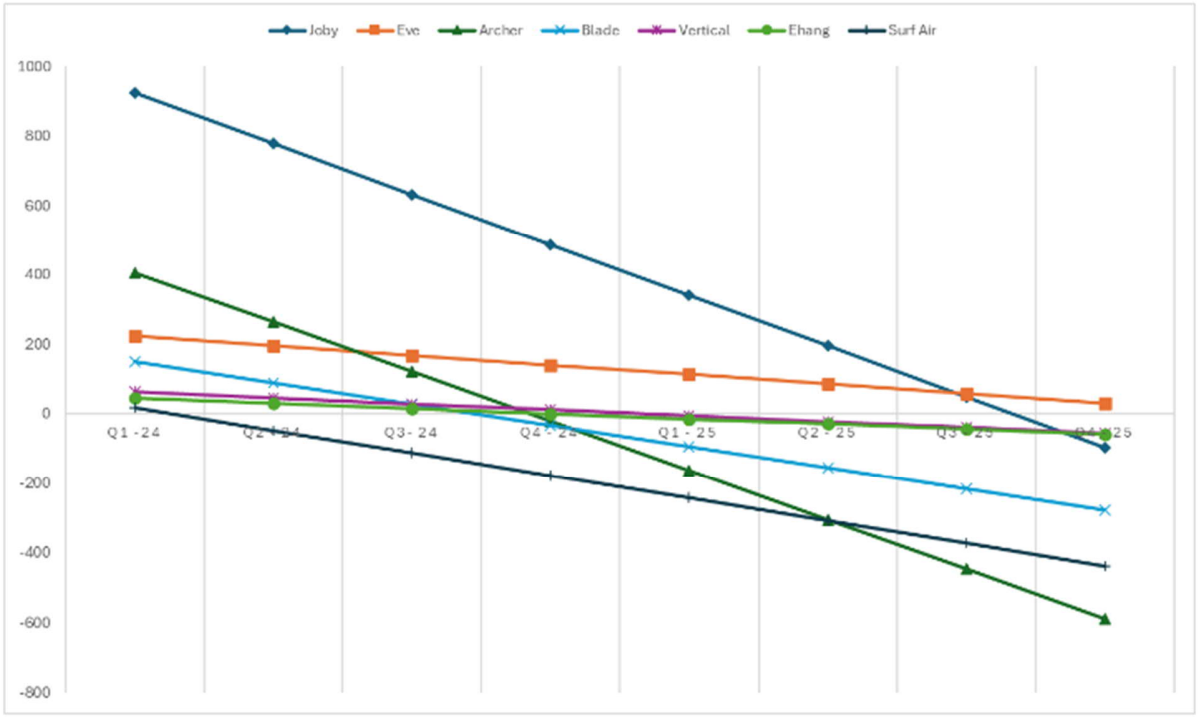
## In Conversation with Vertical Aerospace

Derek Cheng from Vertical Aerospace sheds light on his outlook and the application of eVTOLs including airport-to-city shuttles, inter-city point-to-point, tourism and sightseeing missions. Instead of ferry or other ships to cross shorter distances over water, a future tourist might choose an eVTOL service for eco-tourism, a new mobility experience, and to reduce travel time.

Derek further explains that the demand for eVTOL is evidenced by Vertical's global pre-orderbook of 1500 eVTOL aircraft, with customers comprising airlines, helicopter operators, business and executive aviation, and ground mobility companies. In addition to passenger transport, eVTOLs have the potential to be used for cargo operations, and medical transport services.

## Financing eVTOLs

Presently, some eVTOL companies are generally struggling with much needed financing for development, industrialisation and commercialisation – financing that is particularly needed to overcome certification hurdles to makes these eVTOLs operational and subsequently profitable[5]. These companies have a high level of "cash burn". The chart below shows when cash is expected to run out over time for leading eVTOL companies (assuming no future changes to cash inflow or expenses)[6].




*Source: David Ison, PhD (2024), eVTOL Company Q1 2024 Results*

Although likely to change when the industry matures and economies of scale start to emerge, these companies have also generally struggled to raise funding from traditional sources like banks and even private credit players, save for a few exceptions

[5] Boeck, S. et al. (2023) FAM funding: Capital flows regain momentum despite challenges, McKinsey & Company. Available at: https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/fam-funding-capital-flows-regain-momentum-despite-challenges (Accessed: 15 July 2024).

[6] Ison, D. (2024) How did big eVTOL companies do in early 2024?, LinkedIn. Available at: https://www.linkedin.com/pulse/how-did-big-evtol-companies-do-early-2024-heres-brief-david-ison-phd-vgujc/ (Accessed: 11 July 2024).

for players who have government or defence funding[7]. Given the nascent eVTOL market, one challenge has been to find residual value insurance because eVTOLs are a brand-new certification category of aircraft. Another challenge has been the certainty of creditor protections derived from the Cape Town Convention Aircraft Protocol which is not available to the eVTOL sector. This paper expands on issues surrounding registration of eVTOLs under the Cape Town Convention under the Legal and Policy Implications section. A mature eVTOL market might also see more asset or lease-based financing structures backed by the lifetime value and liquidity of the eVTOL aircraft, like current traditional aircraft structures[8]. These parallels, if achieved could create a boom in much needed traditional financing.

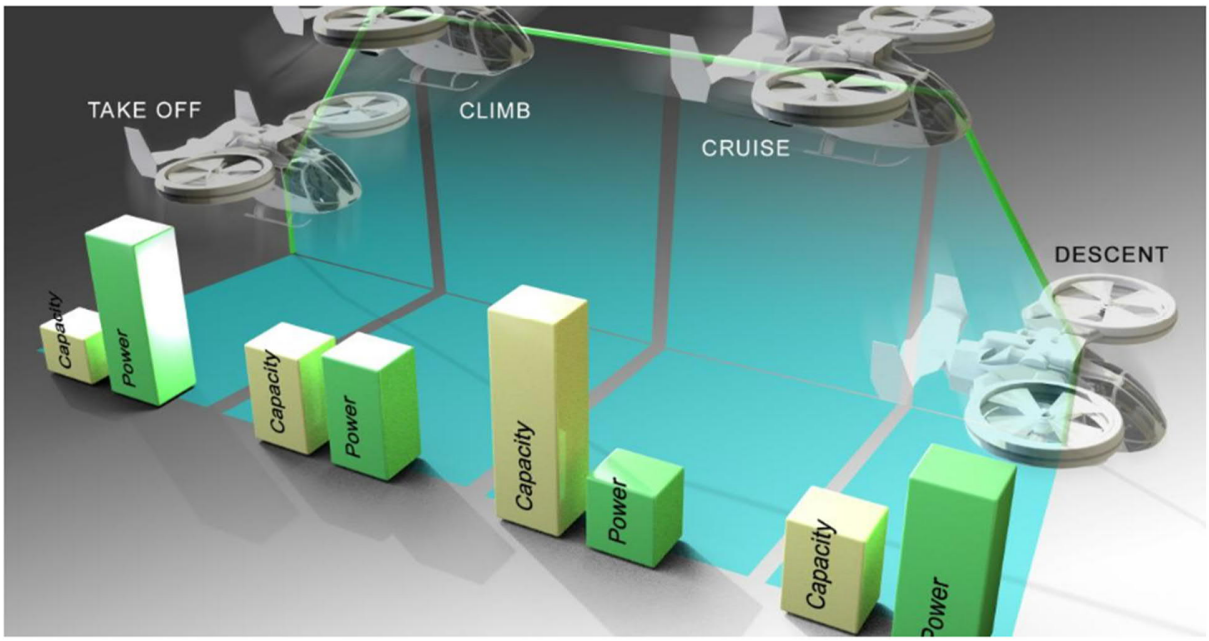
## Powering eVTOLs

Aside from the financing challenges, one is unlikely to see eVTOLs take over blue skies anytime soon due to battery constraints. Research has found that lithium-ion batteries tested in the eVTOL environment show reduced performance and longevity which could potentially pose a safety threat and increase the cost of aircraft maintenance when batteries are replaced frequently. EVTOLS are subjected to incredibly harsh conditions due to the vertical take-off and landing mechanism and would likely be prone to premature and unforeseen damage and corrosion. EV batteries generally drain at a steady rate, whereas eVTOLs require short bursts of high power, especially during take-off and landing. The infographic from Oak Ridge National Laboratory is a good illustration of the capacity and power demands at each stage of a typical eVTOL flight[9].

[7] Boeck, S. et al. (2023) FAM funding: Capital flows regain momentum despite challenges, McKinsey & Company. Available at: https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/fam-funding-capital-flows-regain-momentum-despite-challenges (Accessed: 15 July 2024).

[8] Waters, B. (2024) Private aviation: The future's bright, the Future's evtol. or is it?, The future of private aviation: eVTOL aircraft and sustainability. Available at: https://www.farrer.co.uk/news-and-insights/private-aviation-the-futures-bright-the-futures-evtol.-or-is-it/ (Accessed: 15 July 2024).

[9] Weitering, H. (2024) 'Harsh' eVTOL Operating Demands Shorten Battery Life, Aviation International News. Available at: https://www.ainonline.com/aviation-news/futureflight/2024-03-21/harsh-evtol-operating-demands-shorten-battery-life (Accessed: 15 July 2024).




Despite eVTOL's promise, battery technology must meet the demand of higher energy and power density to make eVTOLs commercially viable. Some suggest this demand could be met with silicone nanowire anodes or through modifying salts in new electrolyte solutions, but these technologies will take years to develop before even being ready to test let alone bring to a consumer market. One thing remains clear, eVTOLs require the highest performing batteries, and given the volume of research to improve batteries, eVTOLs are the first in the supply chain of such specialist batteries. This unique quality and allows aviation specialists to highly customise these batteries to suit the aviation industry that could pave the way for standard certification.

## The Circular Economy of Batteries

Given that the current path forward is through lithium-ion batteries and frequent battery replacement, the question then becomes, how do we make the use and disposal of these batteries sustainable especially in the backdrop of depleting nickel, cobalt, lithium, graphite, and manganese resources required to make these batteries and their unethical mining practices? The answer is a circular battery economy which entails end-of-life batteries being recycled instead of landfill disposal. Solyu estimates these batteries will have less than a year of operation in eVTOLs, assuming a mature operation. We do not have guidance from the regulators on this yet, so this assumes a battery replacement threshold from the OEMs based on EV battery replacement of

20% capacity loss. Although the market is still young because batteries used in electric vehicles have not yet reached the end of their life, there are solutions to many issues that can be considered at this stage. For example, developing standards as to ownership, liability when batteries enter a second life, state of health information, traceability, history and identification of the battery's design and chemistry[10]. Although these issues will be present across all electric vehicles and not just eVTOLs, one way to solve these issues would be record and track ownership of these batteries, a concept already available in the EU battery passport regulations which require that from 1st February 2027, all EV and industrial batteries over 2kWh sold into the EU market will require a unique battery passport in order to be listed in the European market.

## Air Traffic Control

Another hurdle to overcome is integrating eVTOLs into existing air traffic systems. Doing so would require significant advancements in digital air traffic management to accommodate the increased number of aircraft in the sky. Fortunately, similar systems are already being developed with companies such as Heron's AirBridge unified drone fleet and traffic management platform that can be modified to meet local authority infrastructure and integrate with existing aviation infrastructure, ensuring compatibility and compliance with regulatory requirements[11], or EHang's big data based, cloud computing aerial logistics network[12]. The upside is that governments such as the UK are actively looking to address this problem and could spearhead this area of development. The UK government has pledged to back industry stakeholders in facilitating the launch of passenger-carrying, piloted eVTOL air services in 2026, with autonomous flights to be trialled by 2030[13].

[10] Circularity and recycling of lithium-ion batteries for electric vehicles - standardization and safety requirements (2023) CSA Group. Available at: https://www.csagroup.org/article/research/circularity-and-recycling-of-lithium-ion-batteries-for-electric-vehicles-standardization-and-safety-requirements/ (Accessed: 15 July 2024).

[11] Airbridge UTM (2024) Heron Technology. Available at: https://heron-technology.com/aviation/technology/airbridge-utm/ (Accessed: 15 July 2024).

[12] UAM - Ehang's Smart Logistics Ecosystem (no date) EHang. Available at: https://www.ehang.com/logistics/ (Accessed: 15 July 2024).

[13] Alcock, C. (2024) UK government issues action plan for Evtol and UAS operations: Ain, Aviation International News. Available at: https://www.ainonline.com/aviation-news/futureflight/2024-03-26/uk-government-issues-action-plan-evtol-and-uas-operations (Accessed: 15 July 2024).

Ryan Lee from Heron Technology provided his valuable insight on the issue of air traffic control:

*"We are witnessing increasing momentum among stakeholders, particularly in North America, Europe, and East Asia, who are working diligently to establish the necessary regulations, workflows, and digital infrastructure to enable eVTOLs to share airspace. Although it will take some time for the infrastructure to fully support large-scale eVTOL operations, I believe regulators and industries are on the right path to making this a reality."*

# PART 3: LEGAL AND POLICY IMPLICATIONS

## ASEAN Taxonomy and ASAAP

In the past few years, many new taxonomies have emerged to encourage a shift towards green and sustainable finance – financing that considers environmental, social, and governance (ESG) factors of the project. A key taxonomy this paper will focus on is the Association of Southeast Asian Nations (Asean) Taxonomy for Sustainable Finance which is comprised of two parts: (i) the Foundation Framework, for use by companies or governments in the beginning stages of their sustainability journey, and (ii) the stricter Plus Standard for those seeking to demonstrate their capacity to meet tougher environmental requirements. The two-part approach is aimed at addressing challenges that exist between members states at different stages of development such as Indonesia, the world's largest coal exporter and Singapore who is deep in their sustainability journey. The unique tier and traffic-light system allows members states to adapt to these requirements and "level-up" at a faster rate. Crucially, the Plus Standard limb mirrors the European Union's taxonomy which allows for ease of investments[14]. Asean has also developed a Sustainable Aviation Action Plan (ASAAP) with the goal to drive sustainable aviation growth in ASEAN, starting from the area of sustainable aviation fuels and including practises such as share best practices on aviation decarbonisation to support capacity building; facilitating information exchange; and collaborating between member states[15].The development of electric vehicles and the adoption of new battery technologies can exploit these existing policies, using them as a guide for the expectations of policymakers and regulators.

## Singapore's Transition Credits

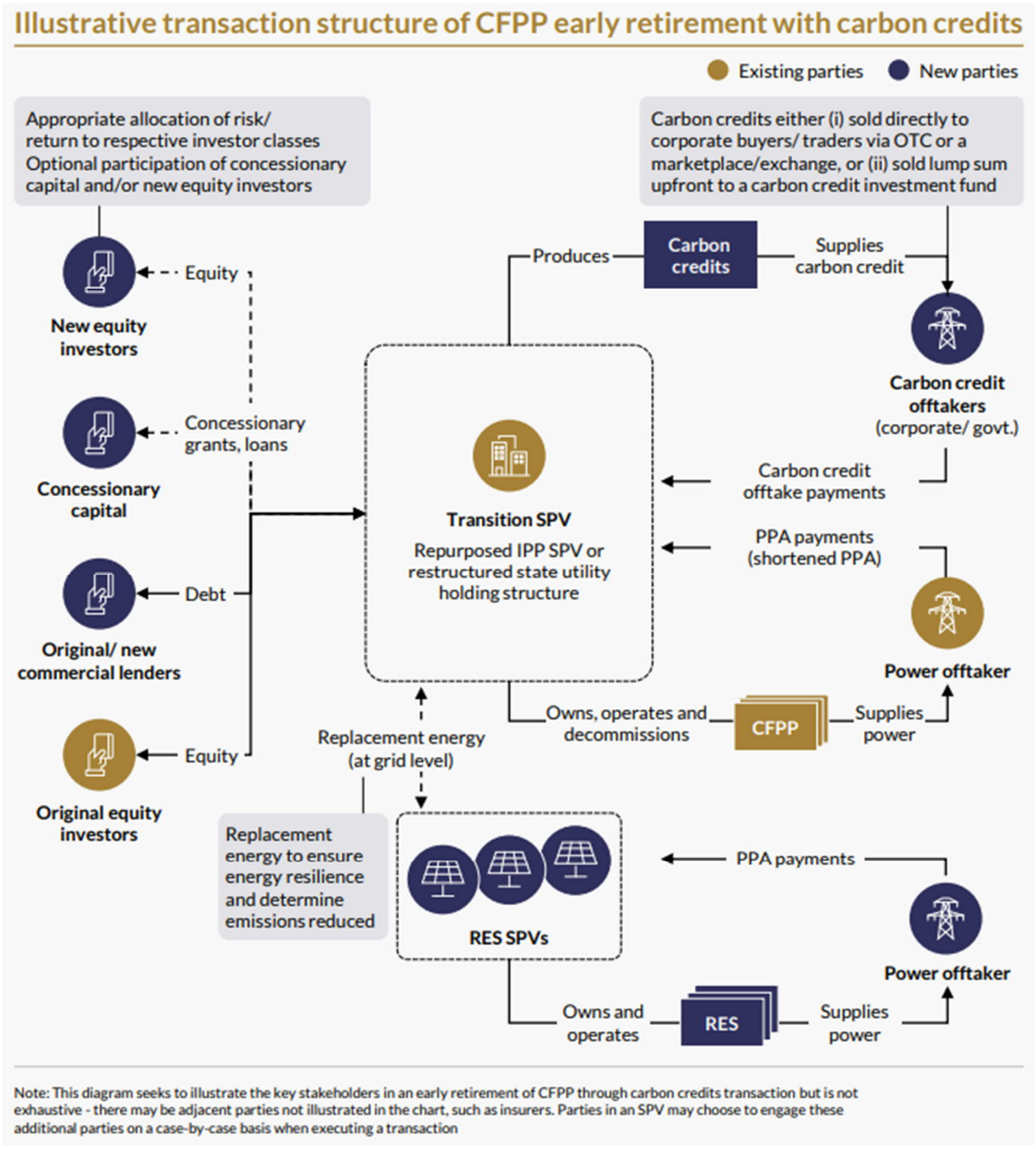
Singapore's Monetary Authority of Singapore is pioneering the use of transition credits to accelerate the early retirement of coal-fired power plants which has yet to achieve scale. Such credits provide a complementary commercial and market-driven financing instrument to increase the economic viability and scalability of early

[14] Lee, K. (2024) How ASEAN designed a green taxonomy for an Asia of contrasts, Green Central Banking. Available at: https://greencentralbanking.com/2024/04/10/asean-south-east-asia-taxonomy/ (Accessed: 07 July 2024).

[15] ASEAN SUSTAINABLE AVIATION ACTION PLAN (ASAAP) (2024) ASEAN. Available at: https://asean.org/wp-content/uploads/2024/04/ANNEX-07-29th-ATM-ASEAN-Sustainable-Aviation-Action-Plan-ASAAP_final-adopted_rev.pdf (Accessed: 07 July 2024).

retirement transactions[16]. The diagram below illustrates flow of equity and implementation of carbon credits:

[16] Accelerating the early retirement of coal-fired power plants (2023) Monetary Authority of Singapore. Available at: https://www.mas.gov.sg/-/media/mas-media-library/publications/monographs-or-information-paper/sg/accelerating-the-early-retirement-of-coal-fired-power-plants-through-carbon-credits---september-2023.pdf (Accessed: 07 July 2024).




*Source: Monetary Authority of Singapore (2023), Accelerating the early retirement of coal-fired power plants through carbon credits working paper*

There is significant potential in using electric aircraft as a replacement for conventional fossil fuel powered aircraft, ships and other forms of transport within the region, reducing the financing and investment challenges this paper discusses in the previous section. Arguably, airline and taxi or ride hail companies with traditional fuel sources who explore new battery technologies could also make use of these carbon credits in a similar manner.

## Singapore-Asia Taxonomy

The use of carbon credits to accelerate the early retirement of coal-fired power plants is one part of MAS' overarching Singapore-Asia Taxonomy that details thresholds and criteria for green and transition activities, focussing on eight sectors. The Singapore-Asia taxonomy is the first of its kind to globally to pioneer the concept of a "transition" category. Like the Asean taxonomy, this taxonomy also follows the traffic light system and a measures-based approach. MAS, in its announcement, has identified hard-to abate sectors such as in the aviation and maritime sector and how it is challenging for vessels to achieve zero emissions and generally meet green thresholds[17]. With safety and type certifications a significant hurdle for new aircraft designs, the maritime industry has seen a quicker electrification transformation, with companies such as Yinson Greentech developing solutions such as electric vessels[18] as a first step to making the industry net zero.

The Singapore Asia Taxonomy is unique in that it is the first taxonomy globally that sets out credible definitions for transition activities which is important establish at the outset because industries cannot immediately move from being brown to green. The focus on transition is critical for hard-to-abate sectors where the energy transition journey faces financing, certification and implementation challenges. Investors, policy makers and businesses can take comfort in the fact that MAS is also attempting to map transitions to other taxonomies and create a guide to increase financing aligned to these common principles[19], positioning Singapore as a key investment centre for the energy transition within aviation and maritime.

[17] MAS Launches World's First Multi-Sector Transition Taxonomy (2023) Monetary Authority of Singapore. Available at: https://www.mas.gov.sg/news/media-releases/2023/mas-launches-worlds-first-multi-sector-transition-taxonomy (Accessed: 15 July 2024).

[18] Electric vessels - Yinson Greentech (No date). Available at: https://ygt.yinson.com/marine/electric-vessels/ (Accessed: 15 July 2024).

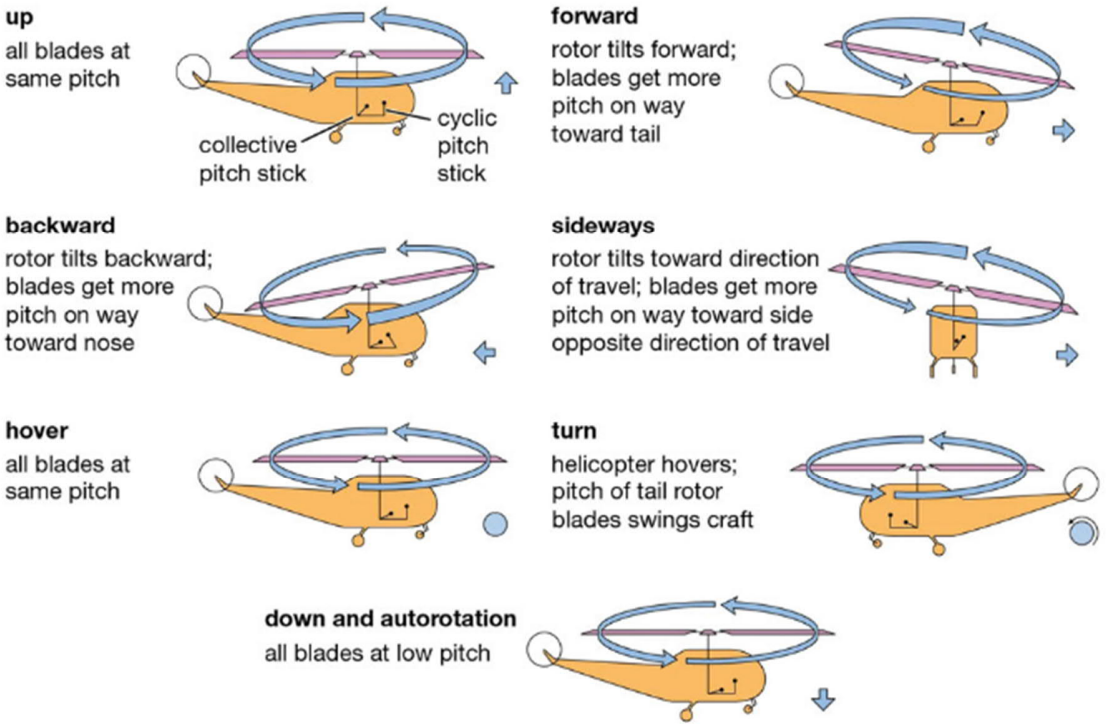
[19] https://www.mas.gov.sg/news/media-releases/2023/mas-launches-worlds-first-multi-sector-transition-taxonomy

## Cape Town Registration

As mentioned above, the Cape Town Convention (CTC) established a uniform set of rules guiding the constitution, protection, prioritisation and enforcement of certain rights in aircraft and aircraft engines. The CTC protects the interest of the sellers, purchasers and creditors through the creation of an International Registry. The International Registry is based on the Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Aircraft Equipment (Cape Town On 16 November 2001), also referred to as the aircraft protocol. To date, the Aircraft Protocol has 84 contracting parties, and it is increasingly rare to finance or trade in aircraft assets without dealing with the international registry.

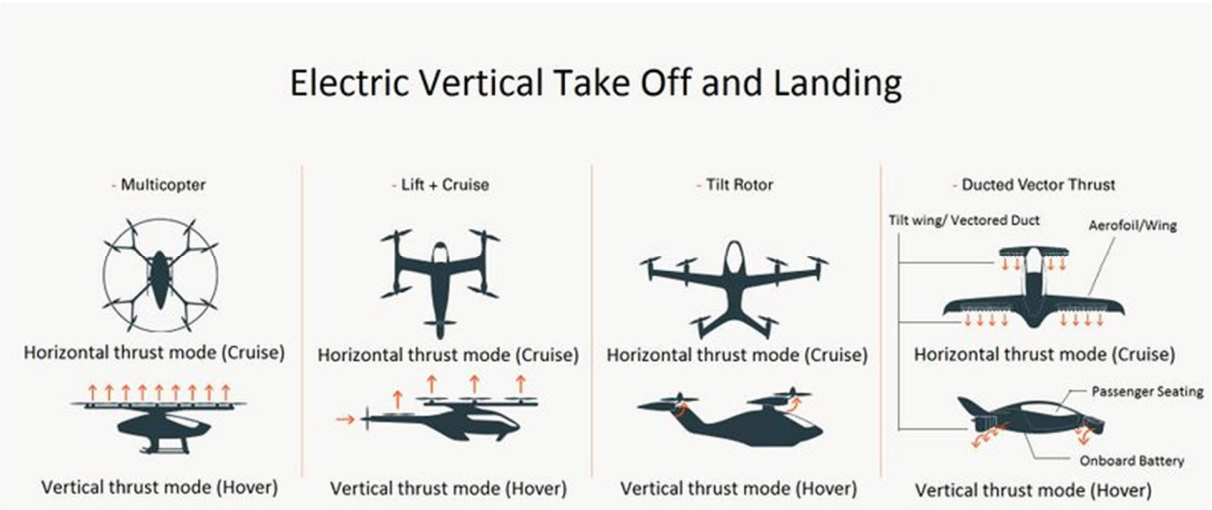
Unfortunately, electric aircraft and new aircraft and drone designs do not fall within the ambit of the Aircraft Protocol. Article 1, Defined Terms, section (l), of the Aircraft Protocol, defines helicopters as "heavier-than-air machines (other than those used in military, customs or police services) supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes and which are type certified by the competent aviation authority to transport …"[20] This is substantially where the issue with registration lies. Unlike planes or helicopters which substantially take-off and land in a standard manner, eVTOLs, electric aircraft and drones do not have one standard method of taking-off and landing.

[20] Aircraft protocol (no date) UNIDROIT. Available at: https://www.unidroit.org/instruments/security-interests/aircraft-protocol/. (Accessed: 15 July 2024).




*Source: Helicopter Pro Flight Training available at: https://www.helicopterpro.com/blog/how-do-helicopters-fly/*

Electric aircraft use a variety of methods such as title rotors and ducted vector thrusts to create lift and directional change.




*Source: Roadmaps MIT Edu available at: https://roadmaps.mit.edu/index.php/File:EVTOL_Overview.jpg*

This begs the question what is a “substantially vertical axes” as stated in the aircraft protocol definition and do eVTOLs, for example, who have a tilt rotor for take-off but stay substantially vertical for the flight, fit this definition? Or must an aircraft be vertical from take-off to landing? It is difficult to opine on whether eVTOLs could ultimately be registered without further guidance. Ultimately, the issue is larger than simple registration and protection of rights, if creditors do not feel they can securely take security over the asset and enforce the security in the event of default or insolvency, then creditors will simply stop lending which has led to the lack of traditional financing we discussed above.

Another legal question arises in respect of batteries as the new form of propulsion for electric aircraft. While the Aircraft Protocol recognises interests in “aircraft engines” which is defined in Article 1, Defined Terms, section (l), they are limited to jet propulsion aircraft engines and turbine powered or piston-powered aircraft engines. As battery passports (see above in Part 2) become more commonplace, legal issues can arise where one legal regime applies to the airframe (as the Cape Town Convention potentially does explained above), while another legal regime related to battery passports applies to the battery, which can impact attachment rules (ie. the legal rules on when property rights of a smaller item attaches and “runs with” or gets transferred with the property rights of a larger item), deregistration and export of aircraft and ultimately repossession rights of creditors and investors.

The energy transition has given us an opportunity to re-design aircraft in a manner never before seen in recent aviation history, but this also creates legal complexity, which the legal community must collaborate on in order to drive certainty, investments and ultimately enable the continued survival and relevance of air transportation.

# CONCLUSION

The electrification of the aviation industry and advancements in battery technologies hold tremendous potential for driving sustainable practices globally. However, widespread adoption faces challenges such as current battery limitations, stringent regulatory processes, and high initial investment costs. Initiatives like Flint's innovative battery solutions and eVTOL development show promise but require significant support and time. A circular economy in battery usage, advanced air traffic management systems, and robust legal frameworks are critical for sustainable growth. Regional cooperation and policy alignment, as demonstrated by the ASEAN Taxonomy for Sustainable Finance and Singapore's use of carbon credits, are essential. The shift towards a fully electrified aviation industry represents a pivotal change in transportation and sustainability. By innovating, collaborating, and investing in these technologies, we can unlock new opportunities for economic growth, environmental stewardship, and improved quality of life. The future of aviation lies in our collective commitment to a more sustainable world.

CONTACT US

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