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Kite Magnetics Views on the Aviation Green Paper

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Chapter 2 – Likely Future Directions Out to 2050

What emphasis should the Australian Government place on these trends to help guide the future of the sector? Are there any other trends the Australian Government could add?

Michele D'Ercole: On top of the intended key objectives, Australia should look at establishing a stronger aerospace R&D and disciplines knowledge ecosystem together with a stronger rotating equipment manufacturing capability. Just looking at the requisition / continued airworthiness side of the equation would not provide sustainable industry growth nor the possibility of achieving all the targets towards net zero.

Chapter 4 – Regional and remote aviation services

What opportunities do emerging aviation technologies present for regional and remote Australia?

Richard Parsons: Hydrogen-powered electric regional aircraft are predicted to have an operating cost up to 50% lower than conventional turboprop aircraft. This dramatically changes the economics of regional airliners in favour of offering more regular regional services on more routes. The lower noise profile of these aircraft will also aid in reducing noise complaints at the same time that underutilized regional airports see an increase in flights.

Michele D'Ercole: Battery-electric, hydrogen, and hybrid aeroplanes have the potential to maximize the utilization of regional and remote airfields. Taking a holistic approach to freight ground transportation and the aviation sector could create an opportunity to develop a common "transportation infrastructure." This infrastructure could include local/distributed solar PV plants, distributed electrolyzers, biomethane plants, and ground-based battery energy storage, among other things. Such an infrastructure would not only enable achieving Net Zero emissions in aviation but also support a holistic Net Zero approach.

Additionally, transitioning from the current complex and unreliable state of the art (i.e., piston engines and gas turbines) to electric motors and batteries would reduce the need for highly experienced engineers and technicians in the field. This shift would enhance point-to-point

transportation and move away from the spoke and hub model. As a result, the development of remote areas would be facilitated, and the full utilization of Australia's resources would become possible.

Chapter 5 – Maximizing aviation's contribution to net zero

How can Government work with industry to ensure a strong and sustainable aviation sector that supports emissions reduction targets while growing jobs and innovation?

Richard Parsons: A major barrier to the development and adoption of new sustainable aviation-related technologies is the high cost and lengthy certification process. Currently, CASA lacks the necessary experience and resources to efficiently and affordably certify new technologies in Australia, particularly when compared to countries like the USA that do not charge domestic companies for certification. Therefore, it is recommended that government support be provided for the certification costs of sustainable aviation technologies and that CASA receive increased funding specifically for these activities. Additionally, establishing a bilateral agreement with the European Union Aviation Safety Agency (EASA) would facilitate the adoption of new technologies developed and certified in Australia to be sold and used in Europe.

Nicky Sigamonie: the government can also focus on supporting and encouraging companies that are working on developing electric propulsion technologies for the aviation sector. Here are some specific actions that can be taken:

Research and Development Funding: The government can provide funding and grants specifically targeted towards companies involved in the development of electric propulsion technologies. This financial support can help accelerate research, testing, and prototype development of electric aircraft and related systems.

Regulatory Support: The government can establish regulations and certification standards that support the initial design and integration of electric propulsion technologies in aircraft. This can involve working with regulatory agencies to streamline the certification process for electric aircraft components and systems, ensuring safety and reliability.

Collaboration Platforms: The government can create platforms and initiatives that foster collaboration between companies working on electric propulsion technologies. This can include organizing conferences, workshops, and networking events where industry players can share knowledge, exchange ideas, and form partnerships.

Infrastructure Development: The government can invest in the development of infrastructure to support electric aircraft operations. This can include the installation of charging stations at airports, the enhancement of electrical grid capacity to handle increased demand, and the establishment of maintenance and repair facilities for electric aircraft.

Market Incentives: The government can provide incentives to airlines and other aviation stakeholders to adopt electric propulsion technologies. This can include financial incentives, such as tax credits or subsidies, for the purchase or lease of electric aircraft, as well as preferential treatment in airport access and landing fees.

Skills and Workforce Development: The government can invest in training programs and initiatives to develop the skills and capabilities needed for a sustainable aviation sector. This can include funding educational programs focused on aviation sustainability, supporting research and development in new technologies, and promoting job opportunities in green aviation.

This will contribute to both emissions reduction targets and job creation in the industry.

Michele D'Ercole: When considering biofuel, it is important to note that relying solely on SAF (sustainable aviation fuel) and hydrogen may not be sufficient. It is also crucial to develop local capabilities in batteries and engine electrification, as all these technologies will have a role to play. However, it is worth mentioning that a comprehensive hydrogen infrastructure will not be fully established until after 2040, assuming there is significant support from the Australian Government. On the other hand, biofuels and battery technologies can be implemented in the medium term.

How can the Australian Government ensure all emitters in the aviation sector play a role in meeting Australia's emissions reduction targets?

Richard Parsons: The Australian Government needs to monitor the actual climate impact of emitters in the aviation sector. This monitoring should go beyond measuring just CO2 emissions and include other activities that contribute to climate impacts, such as contrails and high-altitude particulate emissions. It is important to measure these impacts to effectively address them. Currently, this data is not available.

In addition, the carbon offset market should be regulated to ensure transparency regarding its true effectiveness. It is crucial to account for the true emissions associated with all stages of the lifecycle of Sustainable Aviation Fuel (SAF).

How can policy and regulatory settings support research and development and subsequent investment in emerging low and zero emission technologies and related infrastructure?

Richard Parsons: For commercial investment into zero-emission technologies and related infrastructure there must be a viable business model for private enterprise. At the moment, no cost is considered for the emissions of aircraft, giving little incentive to transition to sustainable alternatives.

Nicky Sigamonie: Policy and regulatory settings play a crucial role in supporting research and development as well as investment in emerging low and zero-emission technologies and related infrastructure. By creating a favourable environment through policies and regulations, governments can incentivize and encourage the development of these technologies.

In the context of the initial airworthiness of zero emissions technologies, policy and regulatory frameworks can establish standards and certification processes to ensure the safety and reliability of these technologies. This includes setting criteria for testing, evaluation, and certification of zero emissions technologies for airworthiness. By establishing clear guidelines and requirements, policymakers can provide a pathway for the integration of these technologies into aviation systems.

Moreover, policy and regulatory settings can also provide financial incentives, grants, and funding programs to support research and development activities focused on zero-emissions technologies. These incentives can help attract private investment and stimulate innovation by reducing the financial risks associated with developing and implementing these technologies.

Additionally, policy frameworks can facilitate the collaboration between industry stakeholders, research institutions, and government agencies, fostering a supportive ecosystem for research and development. By promoting partnerships and knowledge sharing, policymakers can accelerate the deployment and adoption of zero-emissions technologies, leading to a more sustainable and environmentally friendly future.

Nicky Sigamonie: In addition to the importance of policy and regulatory settings in supporting research and development of zero emissions technologies, there are current issues surrounding the initial airworthiness of these technologies that need to be addressed. One of the major challenges is the requirement for joint certification between the Federal Aviation Administration (FAA) and the Civil Aviation Safety Authority (CASA) to approve any new aircraft or engine requiring type certification.

This joint certification process can cause delays in the certification process and time to market for zero emissions technologies. The collaboration between FAA and CASA is necessary to

ensure the safety and compliance of these technologies, but streamlining and expediting this process should be a priority. Closer cooperation and alignment of certification requirements between the two authorities can help reduce the time and resources required for certification, enabling faster market entry for emerging zero-emissions technologies.

Furthermore, CASA needs to work with the European Union Aviation Safety Agency (EASA) to obtain bilateral acceptance of Civil Aviation Safety Regulations (CASR) by EU states. This mutual recognition of regulations would facilitate the global acceptance and adoption of zero-emissions technologies, allowing manufacturers to access a larger market and accelerate the deployment of these technologies on a global scale.

Addressing these issues related to joint certification and international collaboration is crucial to ensuring a smoother and more efficient initial airworthiness process for zero emissions technologies. By streamlining certification procedures and establishing mutual recognition agreements, policymakers can reduce barriers to market entry, promote innovation, and accelerate the deployment of these technologies for a more sustainable future.

Michele D'Ercole: Various Australian start-ups are proposing ambitious projects at the aircraft level, but very few are actively working on new fully certifiable propulsion technologies. This is due to the relative scarcity of aerospace propulsion discipline knowledge in Australia and the relative "inexperience" of local certification authorities in pursuing an aircraft engine certification program independently. To address this, knowledge infusion from the USA or EU is necessary, along with strong collaboration between novel incoming rotating equipment, original equipment manufacturers (OEMs), CASA (Civil Aviation Safety Authority), and universities.

It is important to recognize that the development of certifiable complete propulsion units is much more complex, from a discipline's involvement standpoint, than the development of a novel fuselage of aircraft systems. This fact should be acknowledged by Australian authorities. Currently, the world's recognized aircraft engine OEMs are located in the USA and EU. While China, for example, is capable of certifying an aircraft (COMAC and others), they rely on US engines. Russia's rotating equipment is far behind in terms of reliability and safety compared to those from the US and EU.

The Australian Government should promote technology exchange between the new incoming OEMs, the existing aerospace ecosystem, regulators, and national research centres focused on propulsion disciplines. The complexity and novelty of these disciplines are and will continue to be dramatically important as a key differentiating factor.

What information and guidance is needed to support regional aviation's net zero transition in the context of these emerging technologies?

Richard Parsons:
Information around the true emissions of the aviation industry, including non-CO2 emissions.
Information about the effectiveness of carbon offsetting is offered to customers who fly.
Information about the true emissions of SAF at all stages of its production process.

Chapter 7 – General Aviation

Are there any changes to policy and regulatory settings that might facilitate the GA sector's evolving role in Australian aviation including through protections at GA airports and supporting the transition to a sustainable, net-zero GA sector?

Richard Parsons: Support must be provided to regional airports so that they can embrace the use of new aviation technologies as they become available. For example, the installation of electric charging for electric aircraft or the establishment of hydrogen refuelling facilities.

Michele D'Ercole: A stronger collaboration between CASA and the new-entry OEMs in the electric/hybrid / low emissions space is suggested, at least in terms of allowing fast experimentation and learning.

Chapter 8 – Fit-for-purpose agencies and regulations

What should the Australian Government consider when determining cost recovery arrangements to ensure a safe, equitable and accessible aviation system?

Richard Parsons: Cost recovery for emerging emissions-free aviation technologies should be treated separately from everyday operations.

Chapter 9 – Emerging aviation technologies

How can we build on Australia's strengths to ensure that Australian industry in the sector is able to be competitive internationally?

Richard Parsons: It is crucial to address the issue of an under-resourced national regulator. Timely and affordable access to certification services is essential for companies operating in the aviation technology sector. By investing in and strengthening the national regulator, we can support the growth and development of companies in this space, enabling them to thrive and maintain Australia's position as a leader in new aviation technologies.

How could the Australian Government create an environment that fosters private investment in emerging aviation technologies?

Richard Parsons: The Australian Government can create an environment that fosters private investment by providing:

- A consistent and long-term vision of how they will support this new industry.
- Provide CASA with the resources required to cost-effectively evaluate new technology in a timely manner.
- Foster a reputation of collaboration with private industry, especially in regards to providing support to certification efforts.
- Provide co-investment to support new industries outside of the university environment.
- Remove visa barriers for specialized talent.

What skills are needed for the emerging aviation technology sector workforce?

Nicky Sigamonie, Richard Parsons & Michele D'Ercole : The emerging aviation technology sector, specifically in electric propulsion design and development, requires the following skills:

Electrical engineering: Proficiency in electrical engineering principles and knowledge of power systems, electric motors, and control systems.

Battery technology: Understanding of battery technology and energy storage systems used in electric propulsion, including knowledge of battery chemistry, charging, and management systems.

Power electronics: Knowledge of power electronics and converters used in electric propulsion systems, including inverters, converters, and motor controllers.

System integration: Ability to integrate electric propulsion systems into aircraft structures, considering factors such as weight, space constraints, and safety requirements.

Aerodynamics: Familiarity with aerodynamics principles and their application in designing electric propulsion systems to optimize efficiency and performance.

Thermal management: Understanding of thermal management techniques to manage heat dissipation in electric propulsion systems, ensuring safe and efficient operation.

Testing and validation: Proficiency in testing and validation methodologies specific to electric propulsion systems, including performance testing, safety testing, and compliance with regulatory standards.

Sustainable energy: Knowledge of sustainable energy sources and their integration into electric propulsion systems, such as solar power or hydrogen fuel cells.

Fault diagnosis and troubleshooting: Ability to diagnose and troubleshoot issues in electric propulsion systems, including fault detection, analysis, and resolution.

Environmental and safety considerations: Awareness of environmental and safety regulations related to electric propulsion systems, including emissions control and hazard mitigation.

How can the Australian Government best work with states and territories to foster a supportive

environment for investment in manufacturing of these technologies?

Richard Parsons: To ensure that there is no overlap in the grant schemes on offer. To provide consistent rules and regulations across all states and territories for the implementation of airport-level changes.

What regulatory roles in particular do stakeholders see as critical for the Australian Government to lead to enable the advantages of new technologies while managing the risks?

Nicky Sigamonie : Stakeholders emphasize the importance of global bilateral collaboration with other regulators and the acceptance of mutually agreed-upon regulations. This international cooperation will help address cross-border challenges and ensure a harmonized approach to regulating new technologies.

Richard Parsons: To provide more resources to CASA for the certification of new and emerging aviation technologies.

How will priorities of Government agencies need to evolve as the uptake of emerging aviation technologies continue?

Richard Parsons: Government agencies, such as CASA, will need to place a higher priority on the support of new aviation technologies.

Do Government policies and regulations need to change to better support growth in emerging aviation technology manufacturing?

Richard Parsons: Yes, more support must be provided to CASA to increase their level of expertise in new and emerging aviation technologies and to provide additional resources for the certification process. Furthermore, Australia lacks the key testing infrastructure required to evaluate many components that have been manufactured using emerging aviation technologies.

Chapter 10 – Future industry workforce

What role can reforms to skilled migration pathways play in addressing immediate aviation personnel shortages?

Reforms to skilled migration pathways can play a significant role in addressing immediate aviation personnel shortages. By recognizing existing international LAME (Licensed Aircraft Maintenance Engineer) accreditations within Australia, skilled aviation professionals from overseas can be encouraged to contribute to the industry. Additionally, introducing skilled

migration pathways for power electronics engineers, materials engineers, and software engineers in the electric propulsion domain can help meet the growing demand for expertise in emerging aviation technologies.