HE AROTAKE I TE PŪNAHA TERE-RANGI

AIR NAVIGATION SYSTEM REVIEW

AIR NAVIGATION SYSTEM REVIEW

PHASE 2 REPORT

MAY 2023

WHERE WE ARE – FINAL REPORT PHASE

Our air navigation system is well placed to confront the disruptive forces for change and seize the opportunities to improve future safety, connectivity, growth and innovation.

MESSAGE FROM THE CHAIR

While New Zealand's air navigation system (ANS) is unseen by many New Zealanders, it touches the lives of everyone. An airport user. A drone flyer. A commercial jet passenger. A Cessna pilot. A tourism operator. An air traffic controller.

The system is a taonga of which New Zealanders can be proud. But as with many national treasures, it should not be taken for granted.

New Zealand's air navigation system – and aviation more generally – is currently under pressure from disruptive changes which are amplifying risks and demanding new ways of doing things. New skills, new policies and new regulatory approaches are required.

These changes are also creating exciting new opportunities for value creation, both at home and abroad.

In managing these risks and seizing emerging opportunities New Zealand has some critical advantages. It has an air navigation system that has been and remains safe. The system has the respect and trust of international partner aviators, agencies and nations. New Zealand has demonstrated that it can act as a crucible for innovation. It has also shown that it can drive innovation in distinctive ways, in partnership with tāngata whenua and iwi Māori.

But the risks are also great. It is hard to regulate an increasingly congested airspace with multiple new users. It is challenging to compete on the world stage for inwards investment in innovation. Our airports are at risk from climate change impacts. The cyber security of our system is always under threat. Technological changes are placing both capacity and capability pressures on the air navigation system workforce. Our traditional funding models make it challenging to invest in the long-term infrastructure that underpins the system's resilience and connectedness.

And, in spite of being a small nation, we have not always been good at working together, as an aviation and air navigation system. We haven't always driven collective outcomes and benefits, in addition to the individual missions of the commercial and professional organisations and government agencies that comprise the system.

Hundreds of years after many of our ancestors used the stars to navigate to these islands, we must now adopt and invest in new ways to navigate in a more complex and crowded airspace than they could ever have imagined.

The collective effort required is considerable. But stakeholder ambition is also high. The reward for working together to rethink and reset New Zealand's air navigation system will be improved prosperity, greater connectedness – both at home and with the world – and improved safety and resilience in the face of a challenging and uncertain future.

ACKNOWLEDGEMENTS

The Panel is grateful to the many international partners, local agencies and stakeholders who have given their time and insights to this review.

The Review's sector reference group has worked constructively over many months to contribute diverse perspectives across all sectors of aviation.

The members of Ngā Rau o te Ao Hou (the Māori reference group to the review) came together to begin a new discussion about Māori rights, interests, and opportunities in the air navigation system. Their perspectives as individual experts are invaluable.

Agency experts gave us an appreciation of the complex interrelationships of policy, regulation, and funding settings that influence the system.

Contributions from aviation authorities in the United Kingdom, United States, Singapore, Canada and Australia also helped shape our thinking. These international stakeholders were generous with their time and candid about their aspirations and concerns.

As Chair I would like to acknowledge the dedication of the Panel: Howard Fancy, Ed Sims, and Danny Tuato'o, and the hard work of our secretariat. We all look forward to seeing the air navigation system play a central role in a safe, sustainable, innovative and prosperous future for New Zealand.

Debbie Francis
Chair, Air Navigation System Review Panel

CONTENTS

HOW TO READ THIS REPORT

This review of New Zealand's air navigation system is set within the broader context of the aviation system

The global and local trends impacting on aviation have provided an important context for this review. We have taken an expansive view of the ANS throughout, given that the system touches wider aviation sector issues and a number of other domains. Annex 2 sets out the scope of the system as established in the Review terms of reference.

Our earlier, Phase 1 Report

The Panel's Phase 1 Report set out high-level principles and objectives (see Annex 3). It identified the key shifts required from the current to the future state of the ANS. It also signalled the critical focus areas for developing a future-fit ANS. That Report is available here.

This Phase 2 Report

This Report builds from the Phase 1 Report.

The Panel's Terms of Reference required us to take a system-level view. Accordingly, the recommendations in this report are designed to strengthen system settings, enable decisions based on robust information, and place a strong focus on effective implementation, with the necessary resources, skills, and relationships at hand.

We have not made detailed recommendations about the levels of future investment required, how a user pays plus funding model might be applied, or future agency form. These decisions will require further detailed work.

Our recommendations are intended to respect agencies' individual mandates, responsibilities, and accountabilities, alongside our call for a stronger collective approach to delivering system-wide outcomes.

This Report also does not make technical, tactical, or operational recommendations. Those rightly sit with the agencies and parties who have that responsibility and expertise.

Structure of this Report

Part One sets out the context for our work, outlines the forces for change impacting the air navigation and aviation systems, and the Panel's view that a continuation of the status quo is not an option.

Part Two sets out the eight thematic areas in which the system settings need to change. These each represent workstreams where the Panel suggests more detailed work be undertaken.

Taken together, these eight areas provide the framework on which to build a flight plan for the future of the ANS in Aotearoa New Zealand.

We have emphasised throughout the foundational need to develop a strong leadership vehicle – we recommend an interim and permanent Aviation Council – that will steer the ANS to navigate towards a stronger future.

We outline our views of change implementation in **Part Three**, which relates to priorities and sequencing. A final section outlines what success for the ANS could look like in five years' time. By 2028 the foundations should be in place to support a safe, secure, efficient and innovative system to see us through the next ten to twenty years.

Part one:
Context for Change

The air navigation and aviation systems are experiencing change and disruption

Our ANS was built around jet fuelled aircraft, using an aerodrome or a helipad and operating within a system of airspace design where aircraft operators are subject to stringent rules that guide piloted aircraft and conventional operations, based on control and separation.

While conventional operations and the need for a commensurate rule set will continue for some decades to come, the scope of aviation operations is rapidly expanding.

Here and globally, the system is being disrupted by:

- technological advances and increasing digitalisation. This is facilitating growth in unmanned craft and creating new modes of access and new services
- new business models from new entrants to the system, including urban air mobility ('air taxis') and drones flying everything – from takeaways to prescription medicines and laboratory samples – to and from remote communities
- global jurisdictions seeing the need for navigation systems to migrate to AI platforms and the acceleration of the introduction of new platforms, such as digital towers, to provide safe use of airspace
- decarbonisation, including global goals for net zero emissions by 2050, work on electric, hydrogen, and hybrid propulsion systems and the development of new standards to meet market demands
- the requirement for agile, anticipatory regulation that balances safety and other risks with the pace of change and innovation
- geopolitical shifts and the rise of regionalisation, which are affecting everything from flight routing to regulatory frameworks and the cyber risk landscape
- the need to retain expertise in the system while recruiting for the new skill sets and more diverse perspectives that the future will demand
- recovery from COVID-19 impacts, including dealing with the vulnerabilities exposed by the pandemic; and
- changes being driven in other regions and jurisdictions that require effective interface with our own systems, rules and processes.

As a small, isolated island nation, we rely on the ANS to keep us connected with the world. More than most, we are subject to worldwide forces of change that influence air navigation and aviation more broadly.

These forces create particular challenges for New Zealand in finding ways to:

- lead the system through disruption, applying strategy and systems thinking in the face of ambiguity
- understand the potential value and benefits to New Zealand of investing in the ANS, particularly with regard to enhanced sustainability, security and resilience
- consider long-run investment requirements for system infrastructure and funding mechanisms that recognise both public and private good
- respond to change in a distinctively New Zealand way, including consideration of the rights and interests of tāngata whenua and iwi Māori in the ANS and aviation systems
- modernise our regulatory frameworks and tools to ensure that safety is balanced with agility and responsiveness to the needs of innovators and new entrants
- understand our distinctive value proposition in the world and identify opportunities to leverage connections and partnerships; and
- manage major system risks that would arise from a safety failure or cyber-attack.

Safety is the primary purpose and most important outcome of the system

Amongst this volatility and disruption there is one future outcome that must remain a constant.

Aotearoa New Zealand has built a strong international reputation for safety and as a credible participant and member of the International Civil Aviation Organization (ICAO). Closer to home, this country provides leadership and support for aviation safety in the Pacific.

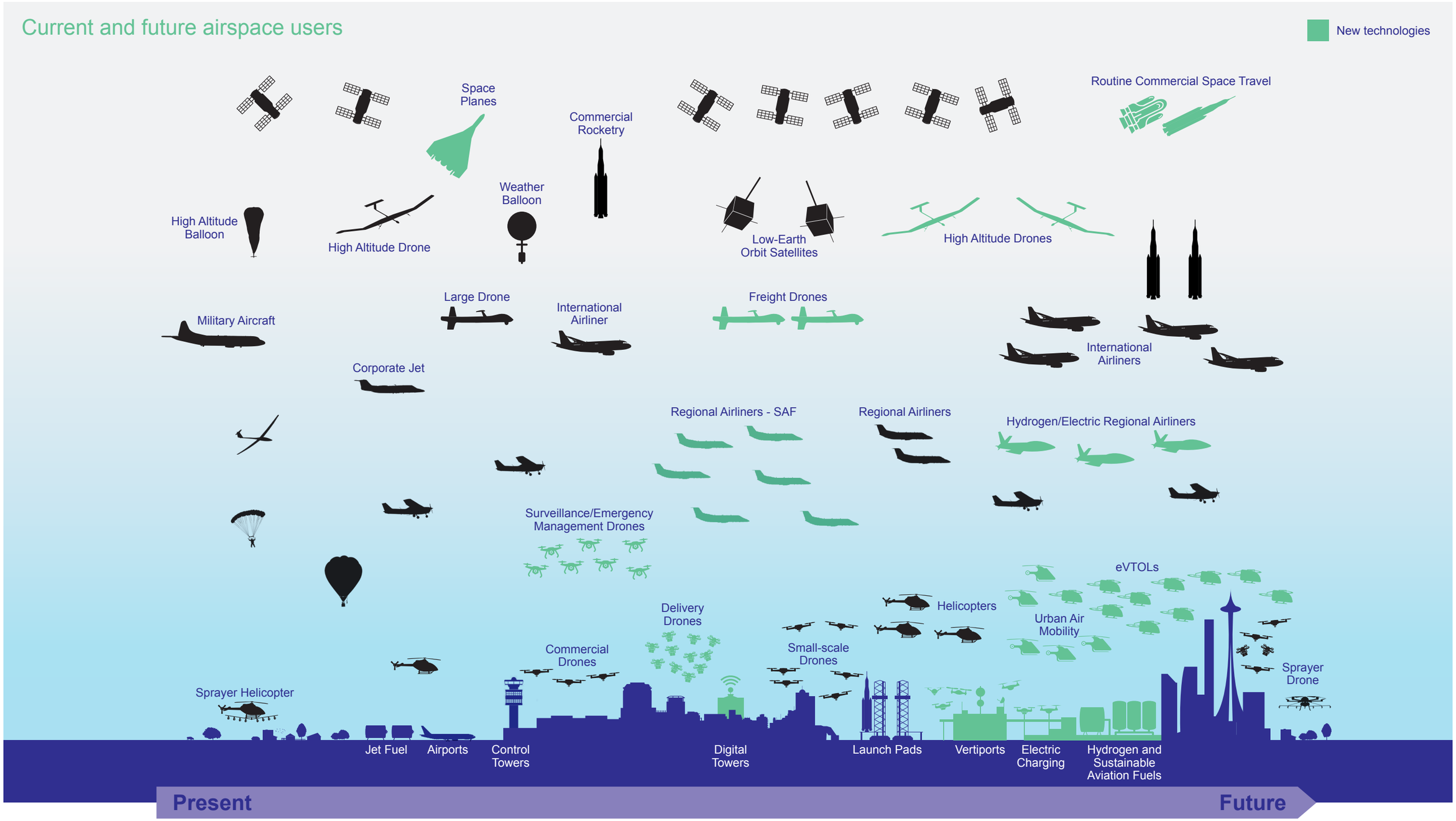
NATS UK and Airways both described the need to maintain a *safety culture*, with safety at the heart of everything they do. The CAA's *Safety and Regulatory Strategy 2022-2027*[1] outlines public safety and security as its primary duty, alongside participants' *"...fundamental responsibility to act and operate safely and securely within the scope of their privileges."*

ANSR stakeholders described a future that remains centred on safety, while also being permissive and agile in response to innovation in line with the ICAO approach outlined below:

As long as safety risks are kept under an appropriate level of control, a system as open and dynamic as aviation can still be managed to maintain the appropriate balance between production and protection (ICAO).[2]

1. CAA 2022. Regulatory safety and security strategy 2022-2027. Accessed here: https://www.aviation.govt.nz/assets/publications/CAA-Regulatory-Strategy-2022-27.pdf
2. ICAO Doc 9859: Safety Management System Manual, Fourth Edition, 2018. Accessible here: https://www.skybrary.aero/bookshelf/books/5863.pdf

Figure 2:
Transition from the current to future system: new users, new uses, new system demands



Change creates opportunities for Aotearoa New Zealand

Our airspace, when compared with those of Europe or North America, remains relatively uncluttered. This is viewed as an asset by innovators. And while our land space is small, the size of the ocean over which we hold responsibilities is large and geopolitically significant.

Companies are developing and testing remotely piloted and autonomous aircraft systems here, attracted by the low volumes of air traffic, favourable regulatory environment (particularly in the mid-2010s), and a strong international reputation as a country with both openness to innovation and an enviable aviation safety record.

The rewards are potentially significant. Pre-COVID-19 market projections for global unmanned aircraft systems and urban air mobility over the coming decade ranged from USD$74 billion to USD$641 billion.[3]

Not surprisingly, there is also real competition for a slice of these benefits. Over the course of the review, we have heard from states, including the United States, Australia, Canada, and the United Kingdom, that are positioning their systems for the future through the development of long-term, integrated aviation and air navigation strategies.

They are matching this level of ambition with comprehensive investment in research and development, supporting innovation, investing in digital and physical infrastructure and in workforce development.

If we don't keep pace and make deliberate decisions about our future direction, we will be left behind.

But we also face significant threats

As recent natural disasters have illustrated, the ANS is key to our response to and recovery from emergencies. This nation's vulnerability to earthquakes is a given, and aviation-based responses are core to our emergency planning. ANS resilience is critical to national resilience.

We know that climate change means that severe weather events will happen more often in future.

We also know factors like sea level rise will threaten the current infrastructure. For example, Auckland International Airport, which receives 75 percent of incoming international passengers, is vulnerable to sea level rise of 0.5m and above.[4] Airports in Hawke's Bay, Northland, Nelson, Dunedin, Invercargill, and the West Coast are also vulnerable.

As the system becomes increasingly data dependent, the potential impact of system failure – including through human frailty – grows in severity. Digitisation creates opportunities for intentional disruption and vulnerability to cyberattacks is increasing.

3. Shaheen S, Cohen A, Farrar E. Urban air mobility: history, ecosystem, market potential, and challenges. IEEE Transactions in Intelligent Transport Systems, July 2021.
4. LGNZ 2019. Vulnerable: the quantum of local government infrastructure exposed to sea level rise. Accessed here: https://www.lgnz.org.nz/assets/Uploads/d566cc5291/47716-LGNZ-Sea-Level-Rise-Report-3-Proof-FINAL-compressed.pdf

The current system must adapt

Against this backdrop of change and disruption, the Panel has concluded that New Zealand's aviation sector offers considerable future potential over coming decades to increase the already substantial value it provides to the country.

The changes outlined above offer opportunities for higher productivity, increased accessibility, positive environmental outcomes and increased national resilience.

But the Panel is also of the view that, in order to take advantage of these opportunities, the ANS requires a fundamental system reset.

The system has not failed. It is not in crisis. But nor is it well positioned to meet future demands.

Its infrastructure must be more enabling of change, better able to accommodate greater and more diverse use of airspace and more responsive and adaptable to new demands and future risks.

Safety must remain at the heart of the system. But, in future, safety will need to be approached in new ways that reflect the growing diversity of users, increased system complexity, a deeper understanding of the processes of innovation and awareness of disruptive influences.

The system-wide effort required to seize opportunities, manage risks and reset the system for the future is considerable. So are the rewards. We must act, and act collectively.

In the next section we outline what we consider to be the eight priority areas for collective action on a system-wide reset.

Rapid development of new and emerging technologies is bringing new opportunities and challenges to the system. Photo credit: Kea Aerospace

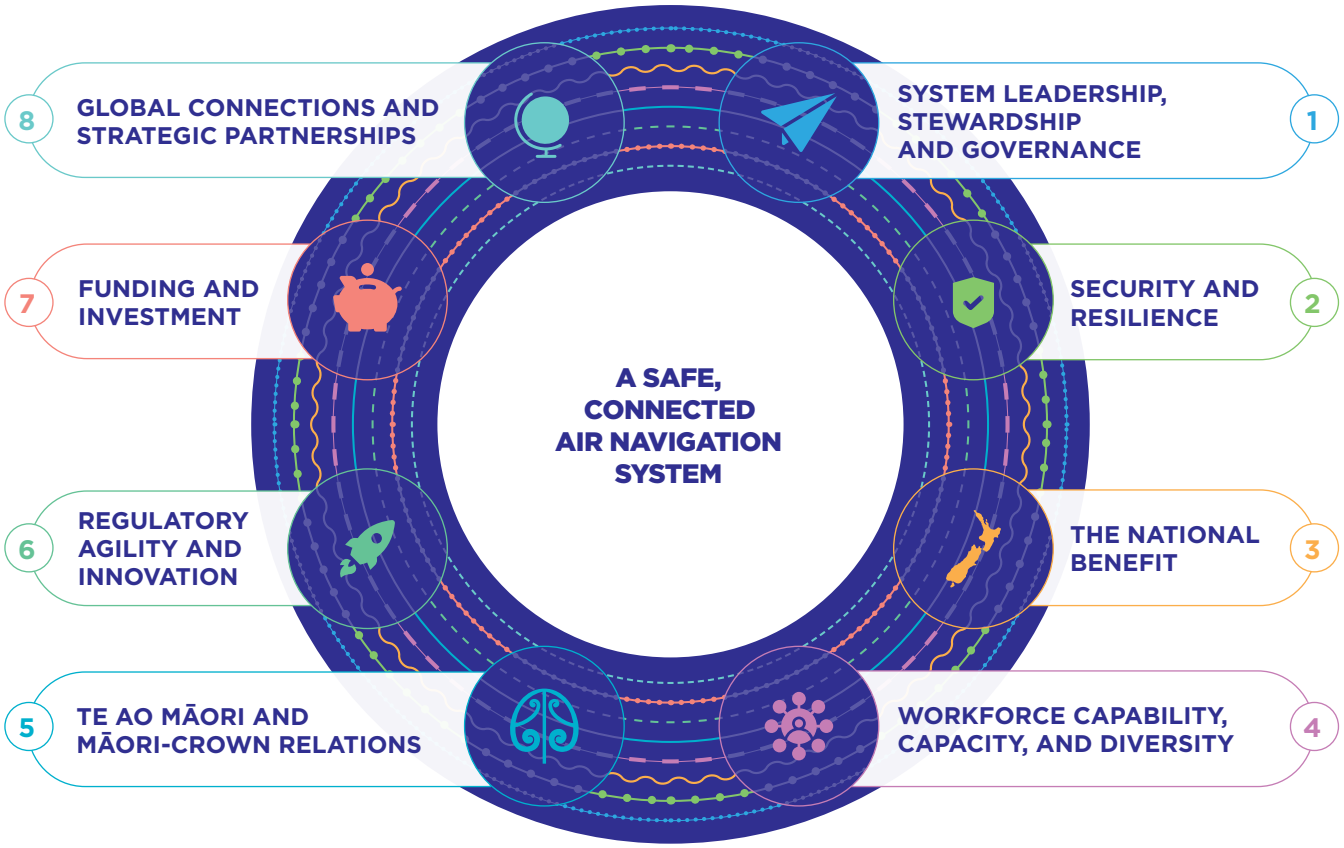
Part two:
Thematic areas for change

THE EIGHT THEMATIC AREAS

The Panel identified eight thematic areas for the change required to deliver a future-fit ANS.

Safety is at the centre as the primary purpose and outcome of the system.

The Panel sees leadership as the critical priority: without direction the system will continue to struggle to move ahead. However, as is characteristic of a complex system, all eight areas are interconnected.



2.1
SYSTEM LEADERSHIP, STEWARDSHIP AND GOVERNANCE

New Zealand's air navigation and aviation system needs a more formal approach to overall system leadership and direction to identify, galvanise and align priorities for current and future performance and investment.

RECOMMENDATION 1:

Drive system leadership, direction and performance through:

- A ministerially appointed **interim and permanent Aviation Council** with whole-of-system oversight responsibilities
- A new and long-range **National Aviation Policy Statement (NAPS); and**
- **A Flight Plan for Aotearoa New Zealand:** a medium-term direction for aviation and air navigation.

WHAT WE HEARD

A consistent theme in the Panel's discussions with local agencies and stakeholders centred on a perceived lack of system leadership. Respondents saw no shared view of critical system risks and high-value opportunities. They saw no clear value proposition for New Zealand within the changing global context. There is currently no body or capability translating issues and opportunities into a coherent and strategic plan for the system.

Feedback from industry and new entrant stakeholders in particular highlighted an absence of leadership and coordination. They saw this as particularly evident in the engagements they had with state sector organisations. Such interactions are often narrowly focussed and lack any sense of an aligned view of how the system as a whole needs to develop.

The ANS, like all complex systems, comprises complex dependencies. Actions in one area tend not to make links to other areas of aviation. Stakeholder concerns traversed areas beyond core air transport agencies, including but not limited to MBIE, Treasury, NEMA, DPMC and the Infrastructure Commission.

Stakeholders also pointed to previous examples of joint work in the system that provided a platform on which to build future collaboration.

For example, led by the CAA between 2014 and 2022, the New Southern Sky (NSS) programme brought together a diverse range of system players. Since the NSS concluded, stakeholders are missing the direction and coordination it provided.

"NSS gave us all a reason to get around the table and thrash stuff out. Without that, we've started moving apart again."

"Now when something difficult comes up, when there are different views, we all back into our corners and say "Well, I'm going to box from here." (Stakeholder)

The current absence of collective leadership is closely linked to an absence of strategic direction for the future of the air navigation system.

By contrast, stakeholders pointed to work being undertaken with urgency in other countries. This includes long range issues scanning, scenario analysis and the development of sector strategies and white papers.

Annex 4 provides examples of work currently underway in the United States, Australia, Canada and the United Kingdom.

The leadership and strategy vacuum is also a symptom of stress in the system. Stakeholders talked about day-to-day pressures crowding out their ability to undertake medium to long range strategic planning and to contribute to cross-system coordination.

Review stakeholders suggested the need for shared investment in horizon scanning and shared contributions to the development of whole-of-system planning, risk and performance management.

This should be in addition to their individual agency missions and strategies in order to identify, drive and secure 'greater than the sum of the parts' outcomes.

"There's so much energy and brains and enthusiasm [in the system]. Getting it all going in the same destination would be awesome." (Stakeholder)

PHASE 2 FINDINGS

The Panel agrees that system leadership is the critical priority

A collective approach to system leadership and performance will be fundamental to meeting the challenges and seizing the opportunities provided by the current and future operating environment for air navigation and aviation more generally.

We see improved system leadership as foundational to all of the other workstreams we recommend in this Report.

This is not a matter of assigning such a role to any one agency. Nor do we see it as a response to the failure of any organisation.

Rather, we suggest that a number of elements need to combine to strengthen system leadership and direction as outlined below.

The system needs to see itself as a system

As a foundation for collective leadership and shared strategy, there is an opportunity for the system to adopt new ways of thinking and working that reflect a whole-of-system approach. In recent times, agencies have tended to adopt projectised and agency specific approaches to key developments, rather than taking a portfolio view across the whole system in service of shared strategic outcomes.

A joined-up view of investment priorities, and the underpinning choices, is needed. This will mean the rationalisation and alignment of a number of inflight projects and reviews. It will also necessitate a collective approach to the governance of key strategic and investment initiatives, both within and across agencies.

The Panel notes that system players tend to look to Te Manatū Waka Ministry of Transport for system leadership. While the Ministry will play a key role in setting the high-level policy direction for the future system, it is not the only public sector player.

Accountability for system-wide performance and outcomes sits with the CAA as regulator, MBIE as economic development agency and the Treasury (as Crown monitor of Airways Corporation, the MetService, and Air New Zealand).

All of these agencies need to partner and collaborate with each other and with private players to develop and govern a portfolio of implementation initiatives in service of medium-term strategy and long run policy settings.

The ANS must have a unifying and galvanising future story

The Panel notes that national-level policy direction for airspace management is now outdated.

The system is lacking a collective aim and focus on the bigger picture reflecting the current operating environment.

We recommend that the Minister of Transport commission a **National Aviation Policy Statement (NAPS)** to replace the National Airspace Policy of New Zealand (2012) and be guided by the Aviation White Paper exercise currently being undertaken in Australia.[5]

The NAPS should set out the long range (ten to twenty year) principles, strategic objectives and outcomes that will act as an enduring direction for the system.

The Panel's proposed principles and strategic objectives are set out in Annex 3.

The NAPS will provide the high-level guidance for policy and regulatory settings and, in turn, more detailed work on shared system vision, strategy and performance metrics.

That work should have a central locus, bringing together perspectives from across the ANS and aviation sector.

NEXT STEPS: A NEW LEADERSHIP MODEL TO DRIVE STRATEGIC SYSTEMS THINKING AND PERFORMANCE

In the Panel's view, current leadership and governance models are failing to provide the necessary strategic focus and direction for the future system.

It is evident to the Panel that there is currently no consistent or aligned view across the state sector agencies about how the ANS needs to develop. There is no overall sense that decisions in one area impact on other areas. It is striking that there is currently little attention or priority given to the potential productivity and access benefits that could follow from new entrants and services.

Drawing on the example of the United Kingdom[6], we propose the establishment of a new **Aviation Council** to fill this gap in capability, to provide a whole-of-system perspective on current and future direction and exercise a much-needed focus on system-level strategy, performance, change management and thought leadership.

The Council will not be just another Committee. It will have public and private sector buy-in and representation. It will compel the Government and private sector to come together with a collective goal to ensure that Aotearoa New Zealand retains a strong and successful aviation sector – and fosters a more adaptive, flexible and agile environment.

Specifically, the Council will add strategic capability to the system by:

- providing a central locus and collective accountability mechanism for system strategy, change management, reporting on system performance, and thought leadership
- offering expert advice, experience and perspectives across a range of critical performance areas and skill sets
- driving greater transparency and alignment across the objectives and outcomes of various interrelated work programmes
- building critical links and relationships with international government and industry partners, organisations and decision-makers; and
- enhancing agency and sector intelligence and long-range scanning of trends and developments with emerging risks and requirements for the system.

5. See https://www.infrastructure.gov.au/infrastructure-transport-vehicles/aviation/aviation-white-paper
6. See: Flight Path to the Future: the UK's strategic framework for the aviation sector: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1079042/flightpath-to-the-future.pdf. The terms of reference for the UK Aviation Council are here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1137859/Terms_of_Ref_-_Accessible_Version_2.pdf

By accessing a breadth of collective expertise, wisdom and oversight, the Council will make the whole system greater than the sum of its component parts. It must complement rather than replace the work and functions of existing agencies.

The Panel does not envisage the Council having operational responsibilities or holding a budget.

The Council's work to enhance system-wide leadership and governance cannot wait

This process should not wait. Urgent work will be needed to lay the foundations for a permanent governing Council and drive progress towards a long-term strategic direction.

We propose a two-stage process for implementing the Council:

- an interim group, responsible for overseeing the establishment of short-term system priorities and objectives and beginning work on the scope and overarching framework for system strategy; and
- the establishment of a permanent Aviation Council to finalise system strategy and provide ongoing advice and commentary on system performance, including future issues, opportunities and risks.

We propose the Minister of Transport appoint an agency lead to establish the Interim Council and an independent, external Chair to lead the permanent Aviation Council.

Both Councils must include appropriate representation from tāngata whenua. A permanent Māori reference group, akin to the Panel's own reference group, Ngā Rāu o te Ao Hou, could support advice on appropriate iwi Māori representation and engagement in this regard.

In terms of its membership, we suggest the permanent Council should include the Chief Executives and/or strategic decision-makers of key agencies (Te Manatū Waka Ministry of Transport, the CAA and Airways) and sector representatives. The Chair could appoint local or international aviation sector representatives to join the Council leadership based on advice from agencies.

The Council would be expected to draw insights from across the sector, including general aviation, larger commercial operators, innovators and new entrants, training organisations, unions, and agencies whose work depends on aviation (e.g., FENZ, health, civil defence, emergency management and defence).

Figure 4 provides an overall schematic of the Panel's vision for the Council's structure and process.

Strategic direction

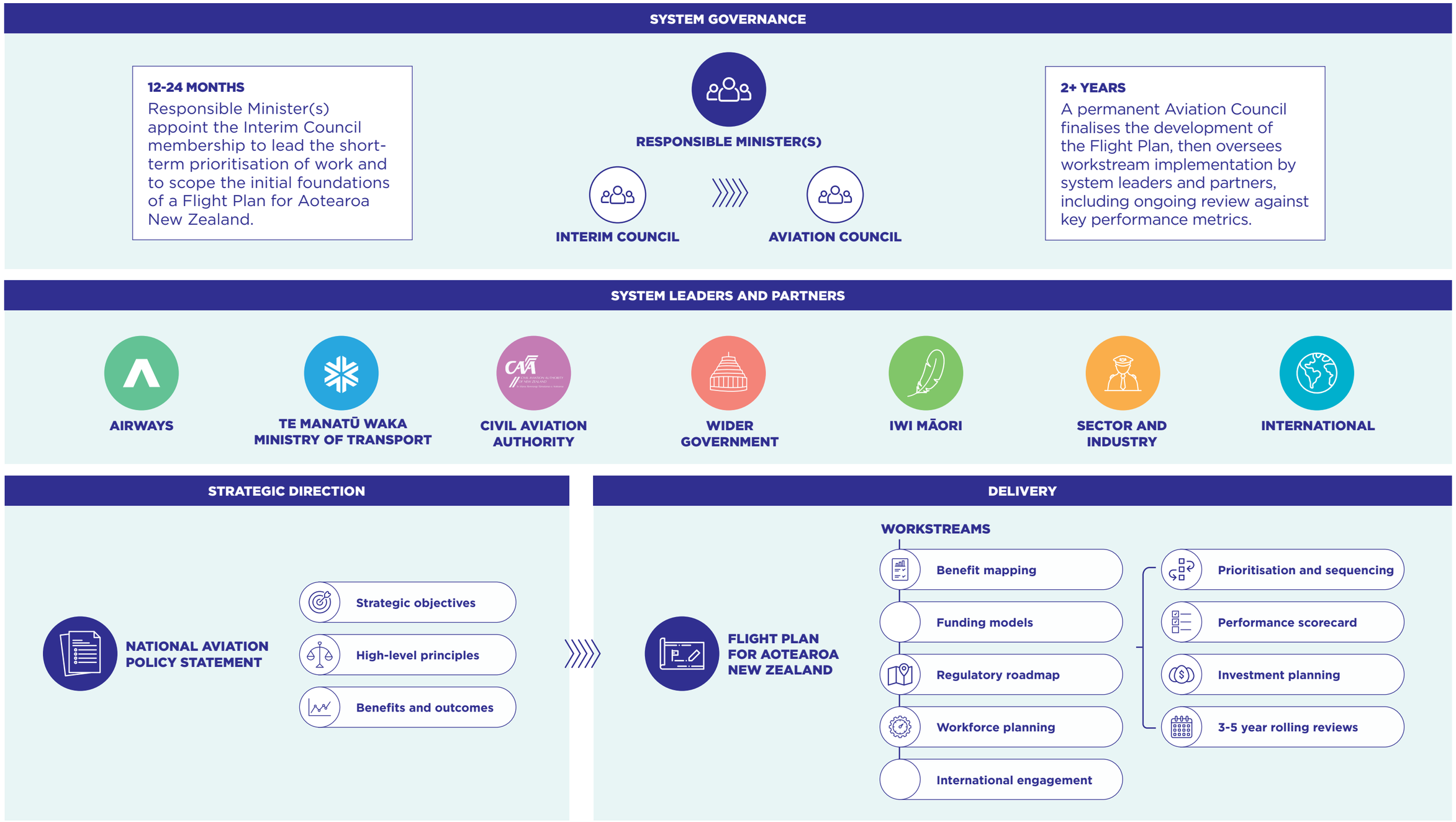
The Panel also strongly suggests the Council should commission and direct the development and implementation of a **Flight Plan for Aotearoa New Zealand (the Flight Plan)**.

This would be the medium-term ANS/aviation strategy, setting out the key focus areas to deliver on the NAPS' long range policy intent, including prioritisation and sequencing, agency accountabilities, investment planning and a balanced scorecard of key performance indicators.

The Flight Plan should be continually reviewed on a three to five year rolling basis to ensure that it remains responsive to the rapidly changing operating environment.

This strategic direction and the ongoing stewardship of continuous system performance improvement will require both a mandate from the Government and a significant level of commitment from system and sector leaders.

Figure 4.
Schematic of indicative structure for system-wide leadership, stewardship and governance



2.2
SECURITY AND RESILIENCE

Aotearoa New Zealand must recognise and protect the vital role that safe, secure and resilient air navigation plays in delivering essential services and safeguarding our sovereign interests.

RECOMMENDATION 2:

Protect the **air navigation system infrastructure, services, and connections** that are critical to national safety, security and resilience through:

- **defining the minimum operating network, service provision and performance standards** for national safety, security, and essential service connections; and
- **decoupling critical infrastructure and service provision from dependence on user-generated revenue**.

WHAT WE HEARD

Stakeholders stressed the importance of:

- a secure and resilient ANS to continue functioning in emergency situations, including the delivery of essential services; and
- the role that a strong ANS has in supporting the security and resilience of Aotearoa New Zealand as a nation and as a credible regional and global partner.

Stakeholders told us that they view the ANS as critical national infrastructure. However, there is currently no system-wide minimum operating network or set of minimum service standards. This means that vital parts of the system are reliant on user generated revenue and are vulnerable to underinvestment or withdrawal of funding.

One regional airport operator described a reliance on short-term fixes like one-off Crown injections (such as the Provincial Growth Fund) and maintaining rather than replacing aging equipment such as power and lighting systems:

"It's all a bit band aids and duct tape." (Stakeholder)

Another described increasing reliance on air links and aviation infrastructure from demands outside of the air navigation system, such as emergency response:

"[Government] just assumes that we'll be there to do it, but we're not paid for it. We're a lifeline utility under schedule 1 [of the Civil Defence and Emergency Management Act][7] but that doesn't help us with funding the operation." (Stakeholder)

We also heard concerns about parts of the system – such as regional airports – being vulnerable to commercially driven decisions in other parts of the system.

7. Schedule 1 sets out the lifeline utilities providers that are subject to certain responsibilities under the Act. The airport companies or entities named are Auckland, Bay of Islands, Blenheim, Christchurch, Dunedin, Gisborne, Hamilton, Hokitika, Invercargill, Napier, Nelson, New Plymouth, Palmerston North, Queenstown, Rotorua, Tauranga, Wanganui, Wellington, Westport, Whakatāne and Whangārei.

For example, though ultimately not progressed, Airways' 2020 proposal to withdraw its services from seven regional airports (including those named as lifeline utilities under Schedule 1 of the Civil Defence and Emergency Management Act) highlighted how the system settings have enabled single-agency revenue pressures to dictate decisions without apparent consideration of wider resilience and connectivity implications. The same applies to decisions made by Air New Zealand as the dominant air transport operator:

"If Air New Zealand stops going to a small airport, they can be in trouble because that's the bulk of their aeronautical services income gone, and most [income] will then come from things like carparking and commercial leasing." (Stakeholder)

Stakeholders also spoke about threats to the security and resilience of the system itself: the impacts of climate change, increasing complexity of airspace, digitisation, cybersecurity and geopolitical changes. Many mentioned the need for a strategic, intelligence-led approach to invest in system-wide security capability and vigilance:

"We can't ignore our vulnerability to bad actors." (Stakeholder)

There is also a broader security dimension. As highlighted by the New Zealand Defence Force, air domain awareness is important for national sovereignty and regional security purposes. It helps maintain our credibility as a strategic partner, a leader in the Pacific and Southern Ocean regions, and a good global citizen. Decisions about airspace surveillance technologies and system security should consider our ability to meet the needs and expectations of our neighbours and strategic partners.

Overall, stakeholders see the system as vital yet vulnerable, and lacking visibility. They stressed the importance of not taking the system for granted and not *'forgetting about the regions'* when making critical infrastructure investment decisions. They suggested that investment should not require a failure to trigger resourcing, and should instead be addressed on a more proactive basis.

"It shouldn't take a big crisis. We have been talking about [this] for a long time, and we have the chance to fix [the issues] before a crisis happens." (Stakeholder)

PHASE 2 FINDINGS

We are lacking an established definition of minimum infrastructure, service levels, and performance standards to ensure resilience and delivery of essential services

The Panel agrees that the ANS is critical infrastructure for national security and resilience, and the system settings need to reflect this more clearly.

We have the opportunity to take stock and set ourselves up for the future by dealing with known gaps in system settings and by understanding and codifying our minimum air navigation infrastructure needs. This should include processes to:

- identify gaps and vulnerabilities through a whole-of-system lens
- prioritise and sustain investment in core system infrastructure, with specified outcomes associated with delivery of essential services
- ensure that decisions made by single operators or agencies do not compromise critical services or capabilities; and
- be transparent about trade-offs, including decisions to change levels of support to system components that are not deemed critical.

This is not a new issue. The New Zealand Airports Association's 2017 Report *Linking the Long White Cloud,* called for definition of and support for key infrastructure and air links.

Linking the Long White Cloud notes that other countries fund airport infrastructure and underwrite essential air links. Yet despite the risks to system-wide connectivity and continuity of essential services here in Aotearoa New Zealand, there is no national approach, policy or norm for service performance.

As part of the Budget process in 2019, Te Manatū Waka Ministry of Transport unsuccessfully proposed a minimum operating network supported by Crown funding and a model for assessing the benefits of investing in regional airports.[8]

The Panel's view is that the case for a national minimum operating network remains valid, and that emerging risks, such as those from climate change-related emergencies, strengthen the case for a national minimum network.

Rapid progress could be made by coordinating with work already underway

There is an interdependency here with the revision of the emergency management framework and its designation of critical infrastructure, currently including but not limited to fuel, telecommunications, information security, and requirements for system redundancy.

ANS agencies should work with the National Emergency Management Agency (NEMA) to ensure the ANS infrastructure (physical and digital) and services are considered for inclusion in the definition of critical infrastructure and for designation under the new legislation as part of the NEMA Trifecta Programme.

Investment in agency and system performance should be viewed through a public good lens

Public good framing of system infrastructure and services should include a shift from the current narrow focus on individual agencies' commercial performance to a wider picture of system level outcomes that we envisage being established in the National Aviation Policy Statement and implemented by the Council under the strategy or Flight Plan.

Like the ANS components, the current system settings can be optimised for better performance. Ministers have a role in setting expectations and using the available tools and levers (for example the public interest provisions in sections 4(1)(c), 7 and 9 of the State-Owned Enterprises Act 1986) to encourage and support monitoring agencies and entity boards to take a broader view.

The Panel's view is that these accountability levers are currently underutilised by monitoring agencies, ministers, and State-Owned Enterprise and Crown entity boards. These levers could play an important role to provide assurance that decisions made in one part of the system do not undermine national security and resilience.

8. The details of the proposal for regional connectivity fund are available here: www.transport.govt.nz/assets/Uploads/OIA-response/OIARequestReRegionalAirConnectivityAirwaysNZStructureAndIncentivesAndAirNavigationServices.pdf

Critical infrastructure and service deployment and maintenance must be supported by sustainable, predictable funding

The provision of nationally critical infrastructure and services should not be reliant on the ability of the asset owner to generate revenue through user charges or on short-term, stop-gap funding.

This recommendation should be considered alongside Recommendation 7: Funding and Investment.

One United States example of a system outage highlights the difficulty of securing funding to attend to critical system upgrades:

United States FAA NOTAM system outage

In January 2023, human error shut down the aging FAA NOTAM system, which alerts pilots of potential hazards along a flight route. The outage caused delay or cancellation of more than 15,000 flights. It was the first nationwide cessation of flights in over 20 years. Early estimates of outage costs run into the hundreds of millions of dollars.

The FAA was aware of the system's fragility. In 2023 it requested $29.4m to 'eliminate the failing vintage hardware that currently supports that function in the national airspace system.'

We are not immune to system outages: in June 2015, a software error caused a loss of communication and air traffic control services across the country. A Transport Accident Investigation Commission report found that the system was not sufficiently resilient, nor was there adequate redundancy. TAIC also noted that Civil Aviation Rule part 171 was not contemporary to the digital system being used by Airways.[9]

The challenge in Aotearoa New Zealand is the current reliance on user-generated revenue to ensure that critical system components (including regulatory oversight) are constantly available and not subject to the volatility of user-generated revenue or budget cycle variations.

The Panel's view is that emerging challenges make this finding increasingly salient.

The system must be resilient to increasing and emerging threats

As noted previously and in the Phase 1 Report, the range of hazards facing the system is becoming increasingly complex, and the consequences increasingly serious.

We explore two examples here: climate change and cyber security.

System vulnerabilities to climate change are well documented. Coastal flooding associated with a one-metre sea level rise would mean 14 airports would need protection or relocation, including Auckland and Wellington International Airports and the regional airports of Hawke's Bay, Gisborne, Westport and Nelson.[10]

9. Transport Accident Investigation Commission AO-2015-005 Unplanned interruption to national air traffic control services, 23 June 2015. Full report accessible here: https://www.taic.org.nz/inquiry/ao-2015-005
10. Peart R, Boston J, Maher S, Konlechner T 2023. Principles and funding for managed retreat: working paper 1. Accessed here: https://eds.org.nz/wp-content/uploads/2022/11/Climate-Adaptation-Working-Paper-1_FINAL.pdf

The same analysis showed that over 1,440 kilometres of roads would be vulnerable, making air links even more important.

Auckland Airport runway sign submerged in floodwaters. February 2023 (Source: Stuff.co.nz)

...and to new cybersecurity risks

The Panel also heard from CAA, Airways, Defence, DPMC, and Air New Zealand that cybersecurity is a growing area of concern.

The Panel is aware that intelligence community agencies are currently considering cyber security requirements for nationally important systems, particularly in light of the complex and growing web of data interfaces to other systems here and overseas.

The amount of information being captured, processed and shared across the ANS is considerable and will grow as aviation and its user-base expand.

Airspace users increasingly depend on the provision of accurate, secure, timely data that is quality-assured and situationally relevant. As airspace management is largely an automated process, open information exchange facilitates operational excellence, decision-making and risk management.

With data comes opportunity but also responsibility. IT is a significant risk to the safe and secure management of our skies. Network volatility, cybercrime and cyber failure are constant, real threats to the entire system. And with the cross-domain nature of airspace and third parties accessing its intelligent systems, maintaining safety and integrity is critical.

Cyber security and cyber resilience should be system-wide priorities, based on global quality standards. New Zealand regulators and organisations must continue to collaborate on all matters relating to cyber security and cyber resilience to protect our skies.

NEXT STEPS: A RESILIENT, SECURE AIR NAVIGATION SYSTEM

There is immediate opportunity for agencies to work together to strengthen recognition of the ANS as part of nationally critical infrastructure.

The first step is working with the National Emergency Management Agency (NEMA) to have NAS components considered for designation as part of the Trifecta Programme, specifically the new Emergency Management Bill that will update approaches to identifying and designating critical infrastructure.

The ANS could then be considered as part of the proposed work by the Department of Prime Minister and Cabinet (DPMC) on minimum standards for critical infrastructure resilience. This proposal responds to recommendation 25 of Rautaki Hanganga o Aotearoa, the New Zealand Infrastructure Strategy, including matters such as:

- whether current minimum standards are adequate and whether infrastructure with higher importance should be subject to higher minimum standards
- whether information sharing on hazards and threats should be enhanced; and
- mapping where agency responsibilities for critical infrastructure resilience lie and if those agencies are adequately funded.

The Panel recommends that the Government revisit options for sustainable, equitable investment to ensure minimum levels of security and resilience are maintained. The mechanism(s) should:

- create certainty for companies on forward investment in infrastructure security and maintenance
- contribute to protection of Aotearoa New Zealand's sovereign airspace; and
- drive transparency and equity around which parts of the system receive Crown funding for national security and resilience purposes.

We recommend that Airways and MetService be recognised as lifeline utilities, given the criticality of their services to emergency response and system resilience.

2.3
THE NATIONAL BENEFIT

Leaders and decision-makers need a full and accurate picture of benefits to articulate the system's value and contribution to health, wellbeing and prosperity in Aotearoa New Zealand as a baseline for future investments.

RECOMMENDATION 3:

Build a picture of the **air navigation system's contribution to the national benefit** by articulating and measuring the system's current and potential contribution, including social, environmental, economic, and cultural outcomes.

RECOMMENDATION 4:

Create accountabilities for system-wide performance and benefit delivery using a **system scorecard**.

WHAT WE HEARD

Stakeholders told us that the ANS enables connections to deliver social, economic and cultural benefits and fosters regional development. The system is also critical in realising the potential for aeronautical and aerospace growth and innovation.

Social and wellbeing connections

The previous section outlined how the system provides access to services like healthcare and education. The New Zealand Airports Association, regional airports and operators, and Ngā Rau o te Ao Hou members also spoke about how it maintains social and cultural connections for remote communities, including hapori Māori.

"Those isolated parts of the country like Tairāwhiti are predominantly Māori communities. When the infrastructure goes down, it hits us hardest and the air links are even more important." (Member of Ngā Rau o te Ao Hou)

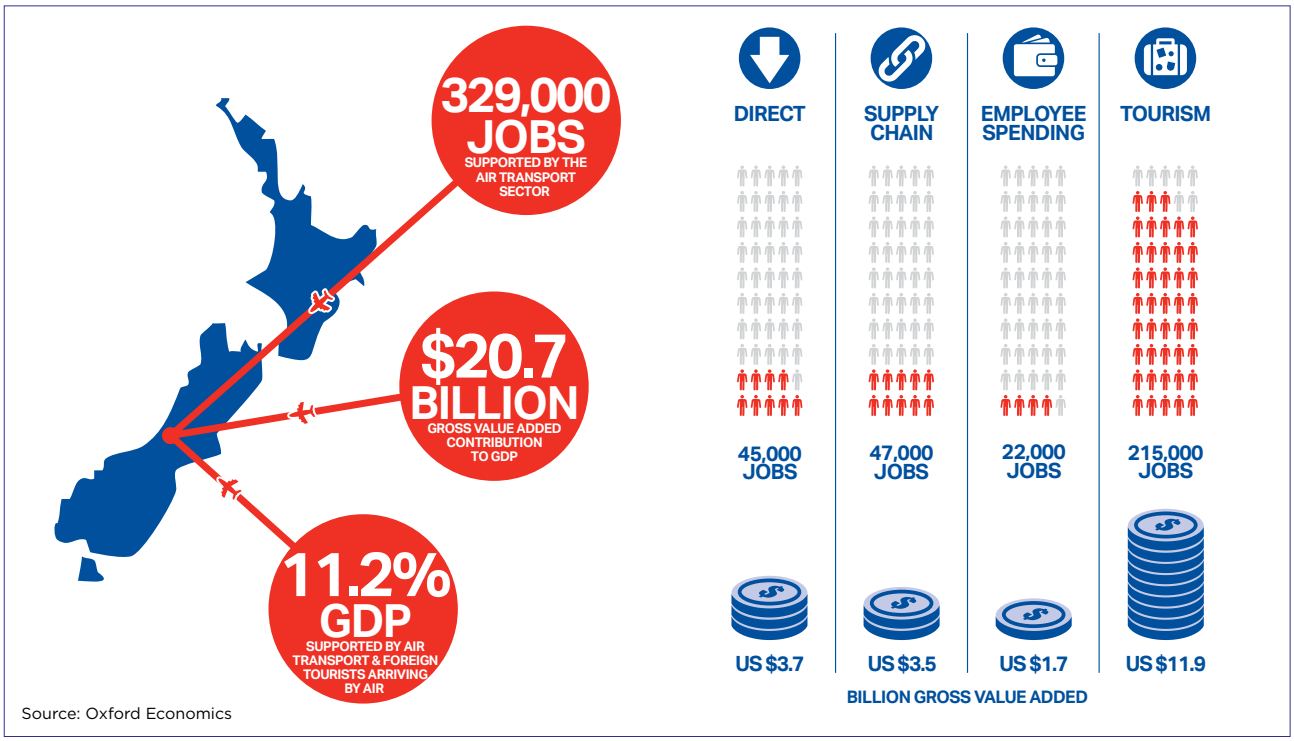
Stakeholders are concerned that in wider social system planning, air navigation and aviation services provision is not integrated into planning across systems:

"... the health service planners just assume that there will be a [air transport] service available to get people across the Alps to Christchurch for their chemotherapy or operation or whatever." (Stakeholder)

Regional development

We heard a number of stakeholders refer to the contribution of aviation to national and regional economic development, primarily for tourism, and the export of high-value perishable freight.

Figure 5:
The importance of air transport to New Zealand



Source: Oxford Economics

IATA produces data showing the contribution that air transport makes to New Zealand's economy, and it is significant, as shown in the infographic above.[11]

Several stakeholders described regional airports as being "essential" to regional economies through employment, air freight, tourism activity and spending – but there is an absence of recent, comprehensive data on how such commercial activity and investment translates to the regions.

The role of general aviation

Aotearoa New Zealand has one of the highest rates of pilot licences per capita in the world: approximately one licence per 213 people. The relatively accessible nature of general aviation in New Zealand makes it an important gateway for aviation careers.

General aviation supports regional connectivity, tourism operations, agricultural aviation and emergency response, and general aviation pilots derive considerable benefit from their recreational and commercial activities. However, this is not well described in calculations of national benefit, nor taken into consideration as part of decisions on system design and investment (see Annex 2).

There are caveats: Parts 2.4 and 2.5 make cases for opening doors to a more diverse range of aviation participants.

11. IATA 2019. The importance of air transport to New Zealand. Accessed at https://barnz.org.nz/wp-content/uploads/2019/09/IATA-NZ-2019-report.pdf

Green growth and innovation

Airports, airlines, the CAA and Te Manatū Waka Ministry of Transport noted that technological advances – particularly aircraft fuel advances to decarbonise aviation – can deliver dual benefits. There are opportunities to reduce emissions, while also benefitting from a growing market for development of low emissions and alternative fuel aircraft and propulsion systems.

Aotearoa New Zealand is known for being agile: the US FAA, the UK Department for Transport, the UK CAA and NASA have all described this country as setting a benchmark for innovation through the Part 101 and 102 rules for uncrewed aircraft.[12]

We are known for fostering aviation innovation, both homegrown and attracted here by favourable operating environments and ease of doing business. As one stakeholder put it:

"You guys can get all the right people around one table. For companies coming in, that makes everything so much easier than in the States or Europe." (International partner)

However, the same stakeholder also noted, with regard to being one of the preferred places for innovators to invest:

"[Aotearoa New Zealand] and Australia are still ahead but the gap is narrowing fast."

PHASE 2 FINDINGS

We need to understand the full picture of national needs and benefits

A full picture of the benefits currently delivered by the system will provide a baseline against which to track future gains and target investment. This intelligence is essential to developing the Flight Plan for the future, monitoring progress, and making transparent funding and investment decisions.

As a remote island nation whose place in the world depends on air navigation connections, and whose fastest and most reliable domestic links are by air, we currently have little information about the current and potential future benefits of the system.

There are only weak signals around the importance of regional air links. For example, as joint owner of five airports, the Crown pays half the operating losses and half the capital costs. These arrangements are legacy commitments, not related to any strategic view of the need for, or benefit from, investment in air connections.

Aotearoa New Zealand is also unusual in that there is no formal allocation of public money to maintain otherwise non-viable air connections for regional growth and social wellbeing.

Australia, for example, has policy settings and funding streams for regional aviation routes that are not commercially viable but are 'essential for the social and economic wellbeing of the communities they serve.' In 2021, the Australian Government provided $26.9m to 89 projects for access to emergency services to ensure the aviation infrastructure is safe and enables regional growth.

12. Civil Aviation Rule part 101 Gyrogliders and parasails, unmanned aircraft (including balloons), kites, and rockets operating rules. Accessible here: https://www.aviation.govt.nz/rules/rule-part/show/101. The Part 102 Unmanned Aircraft Operator Certification rule consolidation is accessible here: https://www.aviation.govt.nz/rules/rule-part/show/102/1

In New Zealand, this lack of a baseline understanding of the network's value makes it difficult to build a compelling case for investment or understand the impact of system changes. Te Manatū Waka Ministry of Transport's advice to Government in 2019, supporting the argument for a minimum national network and regional connectivity, mentioned but did not quantify access and economic development benefits.

The Panel notes the Treasury's advice on the Living Standards Framework already provides sound guidance on the scope of benefits for consideration and on adopting a whole-of-system approach to governance (see also part 2.1), including:

- taking a whole of government approach
- looking at intergenerational outcomes; and
- moving beyond narrow measures of success and considering impacts both positive and negative, across a broader set of areas.[13]

The Panel's recommendations call for exactly this type of approach.

System actors need to coordinate to achieve the benefits from innovation

As noted by our international observers, Aotearoa New Zealand has much to offer aeronautical and aerospace innovators. Our relative isolation, uncrowded airspace and large areas of low population density are attractive for testing innovative technologies.

This is also big business. In 2019, the New Zealand space sector alone was estimated to be worth $1.7b and to support 12,000 jobs.[14]

The benefits extend into educational opportunities, attracting investment in related industries, and fostering our international reputation. Aerospace opportunities are opening the door for iwi Māori to participate in the system and deliver wider benefits. The Tāwhaki Joint Venture is a standout example of Māori-Crown partnership (see also part 2.5).

Such progress is impressive. But we heard of times when the missions and messaging of different government agencies were in tension, in some cases leading to frustration and even market exits by potential investors. The most common example given to us was MBIE's work attracting aerospace innovators to New Zealand, while CAA struggles to deliver a regulatory response that enables those same innovators to conduct operational testing and evaluation.

13. The Treasury (2019) Information on applying a wellbeing approach to agency external planning and performance reporting. Accessible here: https://www.treasury.govt.nz/sites/default/files/2019-11/Fact%20sheet%20-%20Information%20on%20applying%20a%20wellbeing%20approach%20to%20agency%20performance%20reporting.pdf
14. Deloitte for Ministry for Business, Innovation and Employment (2019) New Zealand Space Sector: its value, scope and structure. Accessed here: https://www.mbie.govt.nz/assets/new-zealand-space-sector-its-value-scope-and-structure.pdf

The result is uncertainty, cost and time burdens for the companies involved. As one told us:

"Investors want to see where government wants to go. The fragmented environment is a huge risk to business."

We note the efforts of companies Dawn, Kea, and Merlin to work with the CAA to streamline certification processes and the establishment of the CAA's Emerging Technologies Programme (ETP). Our view is that these initiatives represent a good start for a broader base of collaboration and commitment to shared ambitions and collective accountability for realising identified benefits.

The work will be worth it. The estimated economic benefits to Aotearoa New Zealand from drone-related activity alone are around $7.9b over the next 25 years.[15]

For reference, the CAA's Emerging Technologies Programme received $3.7m over three years in the 2023/24 annual budget process.

Other states have models that we can refer to for system-wide planning, incorporating national interest benefits and driven by collective efforts and accountabilities.

The Australian Government's National Emerging Aviation Technologies (NEAT) policy statement (May 2021) sets out a benefits picture and **a whole-of-government approach for unmanned aircraft system traffic management, regulatory modernisation** and **support to industry** for the adoption of emerging technologies.

At the release of the policy statement, the then Minister Michael McCormack cited the estimated 5,000 jobs and $14.5b increase in GDP from drones and eVTOLS over the next 20 years, $4.4b of which would be in regional areas. He noted that *"the NEAT Policy Statement sets out how we will make the most of these opportunities."*

Decarbonising from a distance: balancing connections and climate

While air navigation technologies are rapidly advancing, slow fleet turnover and high capital outlay mean that conventional aircraft will continue to dominate aviation for at least the next twenty years.

As a small nation that is highly dependent on long-haul air transport and domestic aviation for critical connections, we will have to work harder and smarter than most to honour our commitments and deliver the benefits of greener aviation.

15. Ministry of Transport (2019) Drones: Benefit Study. Accessed here: https://www.transport.govt.nz//assets/Uploads/Report/04062019-Drone-Benefit-Study.pdf

Emerging aviation technology and optimisation of existing ANS components is being accelerated by the need to reduce carbon emissions. Aotearoa New Zealand has signed up to ICAO's global net zero emissions from aviation by 2050, aligned with our domestic framework of emissions targets and budgets under the Climate Change Response (Zero Carbon) Amendment Act 2019.[16]

The formation of Sustainable Aviation Aotearoa[17] is a positive step toward collaboration and coordination of efforts across the system, including looking toward the opportunities presented by innovation and green growth.

Investors will increasingly look at companies' environmental, social and governance (ESG) ratings when considering their options. While companies like Air New Zealand and Christchurch Airport invest in zero carbon initiatives, the incentive to increase passenger numbers is also strong, particularly in the post-COVID-19 era.

There is a delicate balance to strike. A system-wide view of national benefits will enable a clearer, more robust assessment of the macro-level, long-term implications of decisions, including on priorities and obligations that sit outside the direct sphere of the ANS.

NEXT STEPS: TRACKING OUR PROGRESS FOCUSSING ON GROWTH AND INNOVATION

The Aviation Council should develop a system scorecard to track progress and hold system leaders to account for system performance and benefit delivery.

The national benefit narrative should be reflected in the proposed Flight Plan outlined in part 2.1 above. As noted above, it should be monitored by means of a national system performance scorecard, developed and applied by the Aviation Council.

This performance scorecard should assess:

- the performance of the system in its core aviation roles of safety and efficiency
- compliance with international standards and practices
- delivery of benefits in the national interest: social, environmental, cultural, economic as set out in the Treasury's Living Standards Framework; and
- system behaviour: alignment with the proposed principles and objectives in Annex 3 and with established public service practices codified by the Public Service Commission.

The Panel sees value in the Aviation Council providing the scorecard results to Ministers and public release of progress and results.

16. https://environment.govt.nz/acts-and-regulations/acts/climate-change-response-amendment-act-2019/
17. The Sustainable Aviation Aotearoa Terms of Reference are available here: https://www.transport.govt.nz/assets/Uploads/November-2022-Sustainable-Aviation-Aotearoa-Terms-of-reference.pdf#:~:text=The%20Sustainable%20Aviation%20Aotearoa%20%28SAA%29%20Leadership%20Group%20is,to%20accelerate%20the%20decarbonisation%20of%20Aotearoa%E2%80%99s%20aviation%20sector

2.4
WORKFORCE CAPABILITY, CAPACITY, AND DIVERSITY

The future air navigation system will require new capabilities, more diverse mindsets and different ways of working. Leaders will need to source, develop and invest in talent in the context of global skills competition.

RECOMMENDATION 5:

Develop a workforce strategy, in support of the Flight Plan, to **map and close the gap between current and future workforce** diversity, culture, capacity and capability.

WHAT WE HEARD

Stakeholders told us that the air navigation and aviation workforces lack diversity, and that leaders struggle to secure and retain workers with the skills and capabilities that will be essential to the future success of agencies and the system.

What we saw in our discussions was as illustrative as what we heard. The majority of the Review stakeholders represented the system workforce of today: overwhelmingly Pākehā, male and in the second half of their careers. Many are trained in the engineering sciences.

We, and our stakeholders, noted who was there by exception or not at all: Māori, Pasifika, women, younger people. People whose skills have not traditionally been part of aviation or are completely new were also in short supply – from software engineering, machine learning, cybersecurity, propulsion technologies, anticipatory regulatory practice, change management, and futures thinking.

Stakeholders and partners stressed that the global labour market for these skills is heavily competed, particularly for younger workers. As one commentator from NAV CANADA said:

"It's about giving people what they want from work, respond to how they want to work. Values, purpose, contributing to emissions reductions, being part of a good corporate citizenry – these are the things the next generation is demanding." (International partner)

There was general agreement amongst New Zealand stakeholders that agencies, industry and the wider aviation sector need to work harder to make aviation an exciting career prospect.

One stakeholder involved in emerging technologies noted the national benefit potential:

"If we do this right …that'll benefit New Zealand Inc because we will have more young people going into high-paying, high-productivity STEM jobs across the board." (Stakeholder)

The opportunity to share scarce skills came up frequently. In a country this size, the regulator and innovation companies noted that we do not have the scale or reward systems that will attract and keep highly technical experts in one organisation for a long time. Some saw a more porous and mobile workforce as a benefit:

"No one should stay in a technical role in the regulator for more than five years. You've got to get out and see things from a different perspective." (Stakeholder)

The capacity and capability of the CAA as regulator was also a key theme. Stakeholders recognised that the agency needs support to acquire and develop the capacity – and new capabilities – the system will require in future.

The destabilising impacts of the pandemic continue. Reduced service levels and passenger volumes have reduced revenue and hampered the ability to recruit. The pandemic also highlighted the impact of shocks and disruption on the workforce:

"As we rebuild from COVID, a supportive culture is critical as people step back into safety-critical roles and when workforce turnover is high." (Stakeholder)

In this context, we heard from Ngā Rau o te Ao Hou about the importance of oranga: system safety and wellbeing in all its forms. As system leaders are encouraging people into the workforce, they have a responsibility to make sure everyone in the system is safe in every sense of the word.

PHASE 2 FINDINGS

The air navigation and aviation systems need to assess acute skills shortages and plan for future workforce composition, capabilities and attributes

In addition to addressing these issues at individual agency or organisation level, the system should have an overall picture of the scale and nature of future workforce needs.

Skills retention and succession planning will be key, but it will also be critical to include, engage, recruit and develop people who have not been part of the system to date.

System agencies, together with industry, the wider sector, and education providers, should be thinking not just about the key labour shortages of today but also about the attributes, knowledge and skills we will need among system workers in three, five– and ten years' time.

The system must draw on a wider talent pool

Diversity relates as much to having a wide range of ideas, perspectives, skills, and expertise as to fostering a welcoming, inclusive environment for people from all walks of life and identities.

While data are scarce, we have found indications that the system is missing out on engagement with the talents and knowledge of large parts of the community.

The Ringa Hora aviation sector profile[18] covers aircraft manufacturing and repair, airport operations and air transport services. Of the 16,600 people in the sector, 38 percent are female, 8 percent are Māori, 11 percent Pasifika and 14 percent Asian. The average worker earned $97,100 in 2020, more than the New Zealand average wage of $64,000.

Data from the national census[19] revealed that New Zealand had 120 female airline pilots, just five percent of the total (and behind the global average of 5.8 percent).

Globally there is a significant shortage of skills required for conventional aviation. Boeing estimates a global shortfall of 2.1 million aviation professionals (pilots, cabin crew, technicians) in the next 20 years.[20] Note that these figures do not include advanced technical skills required for emerging technologies.

There are examples of concerted effort coming from the sector. A recent joint initiative between Tāwhaki and Aerospace Christchurch resulted in an aerospace careers event for rangatahi, involving visiting leaders from NASA. General aviation peak bodies have, for some time, offered scholarships and training opportunities for young people wanting to come into aviation, with a particular focus on opportunities for women.

These efforts have tended to focus on those who already have an interest: the future challenge is reaching untapped communities and creating a pipeline to develop essential skills.

Diversity of thought and experience is important at all levels of the system

The Panel suggests that the Te Manatū Waka Ministry of Transport and the Treasury, as monitoring agencies, should ensure that diversity and new skill sets are reflected in appointments to the CAA, Airways and MetService boards, and encourage boards to apply the same thinking to senior leadership roles in those agencies.

The Panel notes the example of NAV CANADA. Statute requires that its 15-member board includes the government of Canada, commercial air carriers, the general aviation sector, and unionised air navigation service employees. The purpose is 'to ensure that all interests are brought to the table – and that no one perspective dominates'.[21]

18. Ringa Hora. The Aviation and Airport Services industry. Accessed here: https://ringahora-wdp.nz/wp-content/uploads/2022/08/Aviation-Sector-Snapshot-Infographics_A4Spread.pdf
19. Stats NZ, 2018 Census.
20. Boeing Pilot and Technician Outlook 2022-2041. Accessible here: https://www.boeing.com/commercial/market/pilot-technician-outlook
21. See https://www.navcanada.ca/en/corporate/governance.aspx

The right people in the right places will be central to successful system reset

The most complex and difficult component in any major system reset is bringing the workforce along for the change. System changes are driven by people, not technologies.

In the case of the ANS, that includes people in highly technical, safety-critical roles that require an in-the-moment focus and aim to eliminate or minimise risk and ambiguity. Research indicates that for people in these roles, change processes require deliberate and careful introduction and transition management.[22]

System leaders and agency staff are also limited in their capacity following the impacts of COVID-19, given multiple competing priorities in their business-as-usual portfolios.

This all means that change confidence and capability in the system is currently low, at a time when levels of system disruption are high and resources are constrained.

NEXT STEPS: THE WORKFORCE OF THE FUTURE

Building people capability and professional culture will be central to our system's success, now and into the future.

Government and industry leadership need to work together to develop a comprehensive workforce development plan to address key labour shortages and close the gap between current and future skill needs over the next three, five and ten years.

The Panel recommends the Interim Council initiates work with stakeholders, including Ringa Hora Workforce Development Council, general aviation and other sector actors already active in workforce matters, on a workstream under the new Flight Plan to:

- build on current work and develop new ways to promote aviation and air navigation careers to underrepresented populations including women, Māori, Pasifika and other ethnic communities
- implement specific initiatives to develop and retain change leadership, system thinking and strategic planning expertise in the system
- develop professional secondment and exchange initiatives to share expertise across public and private, regulator and regulated, domestic and international, civil and military organisations
- ensure remuneration and reward schemes are appropriately structured to minimise attrition to neighbouring systems such as Australia; and
- facilitate coordination across workforce planning in related sectors, including information security and telecommunications, as well as individual agencies and companies.

We would expect to see the system scorecard alluded to earlier to include active monitoring of strategic workforce capacity, capability, composition, and wellbeing.

22. Other jurisdictions have started mapping automation scenarios to inform change management. For example: SESAR JU's Automation in Air Traffic Management: long term vision and initial research roadmap (2020). Accessible here: https://www.sesarju.eu/sites/default/files/documents/reports/automation%20atm%20vision%20roadmap.pdf

2.5
TE AO MĀORI AND MĀORI-CROWN RELATIONS

Leaders need to open the door to tāngata whenua and build enduring relationships to enhance the opportunities from partnership and engagement with iwi Māori, where and how the latter see fit.

RECOMMENDATION 6:

Engage proactively and deliberately with iwi Māori to explore and give effect to rights, interests, and opportunities in the air navigation system.

WHAT WE HEARD

Ngā Rau o te Ao Hou, the Panel's Māori reference group, has supported understanding of the system from te ao Māori perspectives.

The group spoke as individuals rather than as representatives of any iwi or hapū, or on behalf of all Māori. Their combined lived experience from decades working in air navigation and aviation, public policy and Māori-Crown relations has been invaluable to the Panel's thought process and recommendations.

Navigation is deeply embedded in Māori history, tradition and identity. Iwi trace their ancestry back centuries to the early Polynesian ocean voyagers, whose legendary skill, courage and resilience live on today through traditional waka hourua navigation by the stars.

Yet these valuable experiences and perspectives – including various tikanga and mātauranga Māori – are not considered or integrated across the system. In many ways, aviation is far behind other sectors in incorporating te ao Māori worldviews:

"Māori think differently about the world. The system isn't designed with this in mind." (Stakeholder)

The group echoed the lack of holistic, integrated systems thinking from a te ao Māori perspective. Core principles including whakapapa, whanaungatanga and the relationship of people to the environment do not have pride of place in the system.

Crown engagement is often sporadic and piecemeal. This can diminish trust and undermine relationships to advance opportunities further. As Ngā Rau o te Ao Hou reflected:

"Crown agencies aren't aware of iwi Māori interests and opportunities in the air navigation system because they haven't thought to ask."

For Māori, the different layers of airspace are indivisible from one another and other elements of the natural world. Yet this segmentation is a key feature of airspace design and classification.

The short-term, commercial focus of airspace management too often fails to consider, let alone balance, the longer-term impacts on the natural world and resources. An absence of system-wide kaitiakitanga comes at the expense of future generations.

This short-term thinking can place Māori communities at greater risk. Cyclone Gabrielle highlighted the existing vulnerabilities in the system due to underinvestment in regional resilience and redundancy. The immediate breakdown of air navigation, telecommunications and air traffic control services made the emergency management response incredibly challenging. Air transport was critical in the following recovery as already vulnerable road links were (and continue to be) severed.

Ngā Rau o te Ao Hou emphasised the disproportionate impacts of these events on remote and rural communities, many of whom are predominantly Māori:

The global village is important, but don't forget about the local village doing the mahi without any of the resources.

Ngā Rau o te Ao Hou also reflected on how the absence of te ao Māori spills over into the working worlds of air navigation and aviation. These can be unwelcoming, even openly hostile environments for Māori, particularly wāhine Māori.

Māori representation and participation in the workforce is low. There are few role models in whose footsteps rangatahi Māori can realistically see themselves following. For example, to this day one member of Ngā Rau o te Ao Hou is the only wāhine Māori to have ever graduated from the Royal New Zealand Air Force (RNZAF).

Except for a few progressive initiatives, te reo me ōna tikanga Māori are not valued or seen as conducive to everyday operations. This can come at a cost for Māori psychological and cultural safety in the workplace:

The system is not a safe place for Māori people to be – physically, psychologically, spiritually, or culturally. There needs to be more of an emphasis on the concept of oranga (wellbeing).

Ngā Rau o te Ao Hou highlighted how fundamental Māori rights and interests in the system are yet to be fully examined from a Treaty / Te Tiriti o Waitangi perspective, including, but not limited to, airspace ownership and management. The group also reflected on the fact that Crown agency monitoring is yet to hold Airways and MetService accountable for their obligations under section 9 of the State-Owned Enterprises Act 1986 not 'to act in a manner that is inconsistent with the principles of the Treaty of Waitangi'.

The members hope this Report will open up avenues in the future to give effect to Māori rights and interests, including shared authority over system design and decision-making.

Photo credit: ©Tāwhaki Joint Venture 2023

PHASE 2 FINDINGS

Iwi Māori rights and interests in airspace management are live, unexplored issues

There are some notable examples of where mana whenua have asserted authority over airspace ownership and have challenged the Crown's consultation and engagement processes.

There is legal precedent for iwi Māori rights and interests in airspace ownership and management.

Under the **Ngāti Tūwharetoa Deed of Settlement**, the Crown conceded ownership to iwi (as kaitiaki of Lake Taupō) for the licensing of commercial operations in the water column and airspace above the lakebed, extending to certain rivers, tributaries and streams.

This claim was disputed for some time by local operators but was upheld by a 2021 declaratory High Court judgement. Other claims to airspace ownership have been made (e.g., Ngāti Unenukukopako over Rotorua Airport) but not elevated to the Waitangi Tribunal.

Examples like this speak to the opportunities for enhanced partnership and engagement. Iwi Māori must be invited to the table, not only as Te Tiriti partners with rights and interests in airspace management but as potential system designers, innovators, decision-makers, investors and beneficiaries.

The problems outlined by Ngā Rau o te Ao Hou will not sound new to either the public or private sectors. They stem from a general lack of cultural capability and awareness, and low Māori participation and representation.

This speaks to the level of untapped potential and opportunity in the system.

There are opportunities for enhanced Māori-Crown relationships and engagement

It's important to acknowledge air navigation and aviation's limited starting point when it comes to engagement and partnership with iwi Māori. Crown relationships and engagement channels are underdeveloped relative to other sectors.

This is not to say that agencies are not making progress. Te Manatū Waka's *Hei Arataki* and *He Waka Maiangi* strategies are working to develop organisational capability and engagement in te ao Māori. The Ministry has a Kāhui of senior Māori advisors already in place and is in the process of recruiting a Māori director position to lead *Hei Arataki* and *He Waka Maiangi*.

Industry efforts are also increasing. Air New Zealand recently issued safety cards in te reo Māori and conducted its first flight entirely in te reo[23] to mark Te Matatini. The RNZAF's Schools to Skies programme is promoting aviation career pathways for women, especially wāhine Māori and Pasifika, through hands-on technical training for Year 13 students and teachers. Merlin Labs also specifically set up shop in Te Tai Tokerau to be closer to tamaraki and rangatahi Māori at the beginning of the STEM education pipeline.

There is an opportunity for this work to go further, faster and be more joined-up across the system.

System agencies could look to the **Tāwhaki Joint Venture**[24] as a model for building positive, forward-looking partnerships.

Tāwhaki leadership on the Crown side took the time to understand local drivers and tikanga to engage appropriately with mana whenua. This enabled project partners to build relationships and expectations first to pave the way for an ongoing kōrero. Government and industry also learned lessons from previous failed engagements.

This is not a one-size-fits-all model. Various iwi, hapū and rūnanga across the motu will have unique interests, drivers and priorities. But it offers a principled approach to start the conversation around similar win-win opportunities that align with iwi Māori interests, potentially including:

- progressing decarbonisation and adaptation in response to climate change
- maintaining security and resilience of critical national infrastructure
- supporting regional development and connectivity; and
- developing a modern, diverse and future-fit workforce.

NEXT STEPS: INVESTING IN PARTNERSHIP

The Panel recommends the Government resource efforts to increase system agency capacity and capability for greater awareness and understanding of te ao Māori. We encourage the wider aviation sector to do the same.

As part of this, the Government and agencies should, in partnership with iwi Māori and through the National Aviation Policy Statement, Flight Plan for the Future and Council arrangements:

- establish a group based on Ngā Rau o te Ao Hou as a permanent expert reference group to advise system leadership and the proposed Aviation Councils on iwi Māori rights and interests and lifting engagement with iwi Māori across the system
- partner with industry and the wider sector to address gaps in Māori workforce recruitment, development and retention as part of the Flight Plan
- explore the use of kaupapa Māori regulatory tools in a civil aviation context, including greater use of tikanga and mātauranga Māori; and
- examine SOEs' performance in line with section 9 of the State-Owned Enterprises Act 1986.

Progress on engaging with iwi Māori and reflecting Māori rights and interests must be included in a system scorecard, incorporating guidance from iwi Māori on the areas and measures most important to their interests, as well as giving effect to the Crown's obligations under Te Tiriti o Waitangi.

There is a long way to go. Agencies will need to invest further in this area, to build and maintain trust and reduce barriers to participation. The role of te ao Māori in shaping ANS design and decision-making can no longer be ignored.

23. With the exception of civil aviation safety-related announcements.
24. Tāwhaki: https://tawhaki.co.nz/

2.6
REGULATORY AGILITY AND INNOVATION

Urgent investment in regulatory capability and culture is needed to catch up and keep up with innovation, to calibrate risks with benefits and to preserve our excellent safety record.

RECOMMENDATION 7:

Strengthen the system's regulatory infrastructure by:

- **developing a detailed regulatory roadmap**, based on the CAA delivering its 2022-2027 Regulatory Safety and Security Strategy[25] and aligned with the Flight Plan; and
- **ensuring the regulator has the capabilities, capacity, and sustained resource** to meet its own and system strategic goals.

WHAT WE HEARD

Stakeholders agree that safety is the bedrock of civil aviation regulation. Avoidance of regulatory system failure and harmonisation with international standards and practices set by ICAO are essential for maintaining public trust and confidence.

At the same time, stakeholders appreciate that the world is changing rapidly and the global rules-based framework is not keeping pace with the times. External disruption (both positive and negative) is requiring new and dynamic approaches to managing safety risks across opaque regulatory boundaries.

The CAA reflected:

"Change on this scale – fundamentally different users and use cases – is highly disruptive to traditional regulators both in terms of processes and people…" (CAA)

Review participants were alert to the dangers of reinventing the regulatory wheel. On the domestic front, one innovator described a tendency to increase rather than optimise our existing regulatory framework, noting that:

"We largely already have the rules and regulations we need under the current framework. It's about interpretation and understanding the safety intent." (Stakeholder)

There is a basis to build on: the 2015 Part 101 and Part 102 rules for uncrewed aircraft were world leading. However, the current perception is that progress has slowed and work to strengthen and modernise the regulatory infrastructure has become fragmented.

The impacts on industry and sector confidence and certainty, not to mention working relationships, are significant and the frustrations real:

"We were initially told that our [part 102] application would take three months. It's now well over a year and we just got a letter saying we don't have a start date yet. We can't run a business like this." (Innovator)

25. Accessible at: https://www.aviation.govt.nz/assets/publications/CAA-Regulatory-Strategy-2022-27-Summary.pdf

The perceptions of a lack of responsiveness apply beyond new technology integration. Airports, airlines, and general aviation spoke to long-standing concerns with airspace designation and the capacity for airspace modernisation.

At the same time, the Panel notes recent successes in regulatory innovation. Following CAA approval, Dawn Aerospace recently tested its Mk-II Aurora Spaceplane, successfully demonstrating rapidly reusable rocket propulsion systems.[26]

In a more prosaic example, the CAA has approved drone delivery of pizzas in the small town of Huntly. Operations are scheduled to start by the middle of 2023.[27]

Both these approvals were done within the current rule framework. However, there is room for strengthening regulatory capacity and capability to enable timely and appropriate regulatory responses to new opportunities.

PHASE 2 FINDINGS

A disrupted system is making increasing demands on the regulator: it needs support to catch up and keep up

There is no question that safety is the primary purpose and most important outcome of the air navigation system. System disruption will introduce new opportunities for safety advances, and also new risks and threats.

The modern regulator needs to keep pace with the rapidly evolving technology landscape and be as or more innovative than those it regulates. Their response must be timely, as the global race for air navigation investment is intense, and failure to adapt quickly will result in investors being drawn to countries with more responsive or permissive regimes.

Regulation is increasingly less about compliance and more about human behaviour and making good choices. In the future, the regulatory system and the regulator will focus a significant amount of effort on guiding system participant behaviours and optimising decision-making conditions.

But in aviation, as in every regulated sector, protection comes at a cost. The regulatory framework must continue to mature and evolve, to balance safety alongside other critical economic, social and environmental benefits.

Anticipatory regulation is being explored in most other jurisdictions. NESTA United Kingdom, a leading innovation agency in this area, describes this as ‘a set of behaviours and tools – essentially, a way of working – to help regulators and government identify, build and test solutions to emerging challenges.’

26. For more information see: https://www.dawnaerospace.com/latest-news/rocket-powered-spaceplane-takes-flight
27. For more information see https://www.rnz.co.nz/national/programmes/morningreport/audio/2018885917/huntly-set-to-get-drone-delivered-pizza#:~:text=Hot%20pizza%20will%20soon%20be,the%20next%20couple%20of%20months

In practice, this means:

- the development of a regulatory mindset that is focussed on stewardship and sees regulatory tools and interventions as both tactical and in service of larger policy and strategic outcomes
- dynamic calibration of the nature and speed of intervention with levels of risk;
- creating safe spaces for trial and error with innovators, such as regulatory sandboxes and incubators
- use of behavioural tools to influence regulated parties, in addition to rules-based approaches
- regulatory frameworks, philosophies and tools that are explicitly designed and well communicated and understood between the regulator and regulated parties
- the ability of the regulator to operate with agility at all points on the continuum of regulatory intervention, including guidance and advice, co-design, prudential approaches and enforcement
- devising new lead indicators of system safety and performance, in addition to the traditional lag measures that have characterised the aviation sector; and
- embracing the potential for big data and digital technology to enhance system performance and behavioural insights.

As the air navigation and aviation systems expand to include new types of operations and business models, the regulator will need to take a dynamic view of safety and risk assessment applicable to both conventional and emerging technologies.

While New Zealand's current domestic regulatory system is beginning this evolution to a more modern regulatory approach, it is also struggling to match the pace of innovation and calls for engagement. It currently has limited capacity to apply the strategic focus that other regulators are bringing to these issues.

For example, the regulator appears to struggle to transition seamlessly between its traditional rules based and enforcement roles to its more modern roles as partner, co-creator and nudging agency.

The regulator tends to default to the traditional, safety-first control mechanisms rather than calibrating its approaches to risk across the regulatory portfolio.

Its links into other regulatory regimes that increasingly impinge on aviation – such as telecommunications, maritime, transport and climate change – will also need further focus and investment.

It might also consider how a te ao Māori approach to regulation could enrich its traditional approach.

All of these demands mean that the regulator will need to focus not just on developing a new regulatory framework that is more future fit, but that it will need to address internal workforce culture and the more diverse skill sets required.

Monitoring agencies have a critical part to play. They need to ensure that priorities in this respect are clearly signalled to their Crown entities. Regulatory modernisation will require support and investment, particularly if changed approaches are to be developed with urgency. The proposed Aviation Council will also have a role in ensuring that regulation is set within the context provided by the NAPS and the Flight Plan, and by scanning for and communicating best practice in other domains or jurisdictions.

Like-minded states are already moving ahead

We don't have to look far for examples of regulatory responses to emergent technologies and capabilities, supported by dedicated resource, which works alongside but not in day-to-day regulatory activities.

Many of these ideas are being reflected in the New Zealand CAA's Emerging Technology Programme, an encouraging early step toward modernisation. It will be important that this programme is integrated into, and not in competition for, CAA's business as usual activities and resources.

The Australian Civil Aviation Safety Authority (CASA) is working closely with industry on a **Strategic Regulatory Roadmap** to set out a future approach to aviation safety regulation and oversight for remotely piloted aircraft systems (RPAS) and advanced air mobility (AAM).

The roadmap refers to work done by the **Future Strategies Taskforce** (part of the CASA Emerging Technologies Programme).

The CASA Board Chair commissioned this work in response to the importance of appropriate regulatory responses to the emerging technologies sector, and its impact on the system more broadly.

Overarching this work is the New Emerging Aviation Technologies (NEAT) Policy Statement, as described in part 2.1.

Work is ongoing: CASA has committed to ongoing consultation and review of the roadmap with industry, including regulatory sandboxes to facilitate innovation.

Again, the Panel notes the importance of avoiding agency silos, situations where a select group of people or agencies make decisions in isolation from the wider picture. The Panel sees this as a role for the Council.

Going it alone is not an option

The ANS is already inextricably linked with other regulated sectors. Increasing system complexity means these overlaps will become increasingly common and complicated.

We cannot regulate in silos, either as a sector or a nation.

The Panel sees opportunity here to be a deliberate and well-connected fast follower. There is opportunity to build on our natural advantages of small size and relative agility.

Aotearoa New Zealand can leverage its sound international connections to adopt and adapt new regulatory approaches and tools – where it is safe and appropriate – from others.

We comment further on international partnerships in part 2.8.

NEXT STEPS: REGULATORY PRACTICES TO ENABLE A SAFE, INNOVATIVE FUTURE

The CAA's cross domain links into other regulatory regimes that increasingly impinge on aviation – such as telecommunications, national security, maritime, transport and climate change – will also need further focus and investment, including policy support from Te Manatū Waka Ministry of Transport and other relevant agencies.

All of these demands mean that the regulator will need to focus not just on developing a new regulatory framework that is more future fit, but also on addressing internal workforce culture and attracting and retaining the more diverse skill sets required. That may include exploring te ao Māori approaches to regulation.

Monitoring agencies have a critical part to play. They need to ensure that priorities in this respect are clearly signalled to their Crown entities. Regulatory modernisation depends on sufficient and sustained support and investment, particularly if new approaches are to be developed with urgency.

The proposed Aviation Council should also have a role in ensuring that the system continues to learn and evolve. This will include setting regulation within the context provided by the NAPS and the Flight Plan, as well as informed by regulatory innovations in other domains or jurisdictions.

2.7
FUNDING AND INVESTMENT

The system must move from a focus on funding day-to-day operations to deliberate, proactive investment in critical system assets, infrastructure and a mix of private and public goods.

RECOMMENDATION 8:

Drive investment into the system through:

- retaining **user pays** as the base funding model;
- **additional and targeted Crown investment** in critical infrastructure, major capital projects, and research and development (the concept of **user pays plus**); and
- opening options for **alternative sources of capital.**

WHAT WE HEARD

Stakeholders who are users – and therefore levy and fee-paying funders – of the system had no quarrel with being charged for the services they receive. They recognise that the system is largely a private good, and it is fair and right that those who benefit should pay.

As in any system, the current funding settings are not perfect. As one said:

"User pays works really well, until it doesn't."

Stakeholders' examples of when the system doesn't work include:

- the system's reliance on user-generated revenue creates vulnerability to shocks and incentivises risk-averse, short-term planning
- parts of the system where users either cannot or will not pay, including nationally critical infrastructure (see part 2.2) and international obligations
- a lack of incentive to invest in key areas for high-capital projects with limited commercial return, including for example:
  - system resilience improvements like cyber security
  - back-up systems to provide redundancy for safety reasons, such as ground-based navigation aids as back-up to satellite systems
  - building digital infrastructure (e.g., instrument flight procedures and airspace design changes) that improve operations for smaller commercial or recreational aircraft, particularly at regional or remote aerodromes
  - climate change adaptation costs; and
  - long-term growth and innovation, including for example system resilience and innovation, regulator capability and capacity, and research and development (including the workforce of the future):

One stakeholder commented:

"The [funding] model does not support innovation. For example, digital towers would be a useful addition and are suitable for New Zealand, but Airways' funding model doesn't support longer term thinking about investment in that sort of infrastructure. Air New Zealand doesn't want to pay for it alone and that's fair enough." (Stakeholder)

Another gave the example of the Volcanic Ash Advisory Service:

"This is an ICAO requirement, a global commitment, but the functions provided by MetService and GNS are largely funded by Air New Zealand and only cover some of the cost. Even though international carriers benefit, there's no mechanism to have them pay." (Stakeholder)

Some respondents suggested that the Airways dividend under the SOE model should automatically be reinvested into the system for critical infrastructure investment.

Others considered that the level of sustained investment required for the system of the future will be far greater and required a new approach. What we heard from overseas partner agencies supports this.

For example, Singapore is planning ten years ahead for replacement of its air traffic management system and anticipating a spend in the hundreds of millions of dollars.

The United Kingdom and Australia are adopting strategies for aviation that explicitly link system outcomes and wider benefits to funding and investment.

The Panel heard is that local system settings are creating inertia that is not driving commercial, social, cultural or environmental gains. The challenge now, as one stakeholder said, is to:

"... stop arguing in circles about who should pay for stuff and start thinking about how we invest in where we want to go." (Stakeholder)

PHASE 2 FINDINGS

User pays is appropriate as the primary source of system funding, but it doesn't cover all system requirements

User pays is, and in the Panel's view should remain, the primary means of funding the day-to-day operations of the ANS where the cost of most aviation operations falls naturally and appropriately to users. Where users cannot or will not pay, the service will generally not continue. This is consistent with the public finance principles of the costs falling to those who use and benefit from a private good.

Despite operating in an effective monopoly, the degree of transparency for service users in Aotearoa New Zealand is good. NZIER provided the Panel with an assessment of funding settings. It included the pricing methods, for example those Airways indicated a high degree of clarity, and consistency with the principles applied by the Commerce Commission (noting that Airways is not subject to Commission oversight).

However, the Panel agrees with stakeholders that the user pays model has gaps and inconsistencies. We also heard numerous examples of instances where the Crown becomes the default funder for essential system components that are not commercially viable.

For example, in 2019 the Crown provided Airways with a $10m capital injection over three years to buy five new ground-based navigation aids and a further $400,000 per annum for operating costs. The CAA's safety assessment deemed them critical to system safety: the aids complete a minimum national network for back-up if the country or individual aircraft lose the GPS coverage necessary for satellite-based navigation. Airways declined to fund them as users argued they should not pay for navigation aids that they would not normally use, and Airways would not be able to recover costs from those aids.

The key here is transparency and consistency, neither of which are obvious in the current system settings. We refer back to our findings in parts 2.2 and 2.3: there appear to be gaps in funding public goods, but without a comprehensive needs analysis it is difficult to pinpoint how well (if at all) these are being dealt with and whether funding is being effectively prioritised according to risk and benefit.

We also noted Crown investment in parts of the system, including the $15.7m in 2022 on joint research with NASA, $3m for trialling uncrewed aircraft, and the aforementioned $3.7m for regulatory development in support of the aerospace industry.

There is no apparent appreciation of the investments required in other parts of the system to realise the benefits of supporting new technologies, for example an air traffic management platform that enables integration of new capabilities and a fully resourced regulator.

Furthermore, there are essential links to other domains. Introduction of electrically powered aircraft is dependent on a charging infrastructure safe and suitable for aviation purposes. Both are high capital cost investments with long lead times.

Aotearoa New Zealand needs to plan for long-term, strategic investment in the ANS

The Panel found current policy and funding settings assume that system users and beneficiaries are both known and subject to charging mechanisms.

The settings also assume that the metrics for future service quality and scale of growth will be obvious and can be factored into planning.

Finally, the settings assume that users who drive system changes will pay for those upgrades.

When we look at the future of the air navigation system, none of these things is certain.

The Panel's view is that the current default assumption that domestic system participants are willing and able to pay for the next generation of system components is increasingly unworkable, given the pace and scale of change and investment and the size of our market. Future technologies will have a shorter lifespan, and there will be less time to recover capital and operating costs.

Aotearoa New Zealand has a window of opportunity to plan for, commission and partner for system development to maintain safety, keep pace with international standards, broaden our options, reduce risks, and give system actors and investors increased certainty to move forward.

System actors should consider other sources of capital to support strategic investment in the air navigation system

The Panel noticed a tendency for stakeholders to talk about funding for the system solely in relation to user-generated revenue and Crown investment.

Airways, and to a lesser degree MetService, referred to being constrained by what its users can afford and what it can reasonably charge according to its shareholder expectations. They did not refer to options for raising capital from other sources.

UK NATS noted that one of the main reasons they were privatised was to access private capital, enabling the sort of long-term certainty that a wholly user pays or wholly government-led ANSP (e.g., FAA and Airways) will struggle to achieve. In a market the size of Aotearoa New Zealand, that struggle will be even greater.

The Panel's view is that investment without an overarching strategy and over-reliance on user pays currently drives short-term, siloed thinking and ignores a potentially rich array of other investment options.

International partnerships will be a critical component of future progress

Internationally, investment in ANS research and development is significant. The United States'

NextGen national airspace modernisation programme will cost approximately USD$37 billion through to 2030, resulting in expected cost savings of $USD106 billion.

The Single European Sky ATM Research (SESAR) Joint Undertaking Programme – a public private partnership to accelerate digitisation – has a 2016-2024 budget of €1.6 billion. This is a prime example of states collaborating to deliver benefits far greater than would be possible alone.

We have links into these agencies. Te Manatū Waka Ministry of Transport, CAA, MBIE, Airways, Airways International, MetService operators, general aviation, professional organisations, and innovators all have strong relationships across a range of international agencies and research programmes.

The major investments and system changes occurring in other countries and regions create opportunities to reduce cost and risk through major investment partnerships and utilising existing research (e.g., by SESAR and NASA). We need to strengthen these relationships, move away from the idea of Aotearoa New Zealand exceptionalism and focus on strategic fast following.

One of our international contacts, when asked what keeps them up at night, said:

"There are a whole range of long-term problems and challenges. It's hard to know when it's the right time to jump, to make a call on which thing to invest in, what to implement. When you look back you will always think "Did we do the right thing? But the most important [thing] is that you ask the questions and take some actions. You will always regret not asking and doing nothing." (International partner)

NEXT STEPS: FROM SHORT-TERM FUNDING TO STRATEGIC INVESTMENT

The Panel's view is that system leaders must understand the scale and nature of the potential capital investment in the future system. The Council could lead the scoping of the future investment needs.

The Flight Plan should include regular revision of forward-looking scale and scope estimates to keep up with the pace of disruptive change (and shifting risk) in the system.

The Council should advise the Government and agencies on the sequencing, approaches and costs required to build new system operating capabilities, processes and leadership. Such costs should be met in part through prioritisation and embedding a strong future orientation into existing budgets.

We suggest that the Government, as the owner of Airways and MetService, should examine how small but critical commercial organisations, with high fixed costs and reliance on user revenue, can best plan for substantial future investment needs.

Regarding user pays plus, the Panel recommends that the Council oversee work by agencies to develop a modified future funding system by:

- assessing the services provided and the fixed and variable costs that will be attributable to different users of airspace
- identifying and assessing those areas where there is a need to strike a balance of public and private benefits
- assessing options and costs, for ensuring the system has adequate redundancy; and
- scoping and assessing the opportunities of arrangements with other jurisdictions on major capital projects.

The scale of capital investment and funding changes should be integrated into Te Waihanga's oversight of New Zealand's future infrastructure requirements, including the options to access funding from financial markets.

If we do not want to optimise in silos, we should not invest in silos. Funding and investment models will need to move towards a comprehensive and more strategic investment strategy for the system as a whole and span the full range of physical, digital and human capabilities.

2.8
GLOBAL CONNECTIONS AND STRATEGIC PARTNERSHIPS

Clear system-wide priorities and understanding of Aotearoa New Zealand's international value proposition will enable us to leverage our strengths and connections on the world stage.

RECOMMENDATION 9:

Leverage our relationships to influence the international agenda and further Aotearoa New Zealand's sovereign interests.

WHAT WE HEARD

The global air navigation environment, activities of other states, and Aotearoa New Zealand's place in the world, were a frequent point of discussion and have been well canvassed in previous sections.

We know we have a strong reputation to protect. The CAA, Airways, Air New Zealand, and increasingly, our innovation sector and MBIE are seen as progressive and agile. As one United Kingdom commentator noted, we, in Aotearoa New Zealand, are *"...small enough not to be a threat, politically fairly neutral, and get credibility by being safe."*

Our domestic stakeholders are rightly proud of the access we have to global fora and our agency and industry networks. However, commentators here and overseas noted that our size and geographical position also make us vulnerable.

Among offshore ANSPs and policy and regulatory agencies, there was much talk of how increasing disruption is forcing rapid change in a very uncertain environemnt, and what the FAA team described as a *"recipe for escalating costs."* From the perspective of a fellow small state (albeit with very different system settings), our Singaporean commentator noted that *"like us you are small, you will always be a price taker."*

At home, stakeholders talked about needing to make better use of our global connections, in the words of one, to 'steal with pride,' working with and learning from the work and the investments of others. As NAV CANADA noted *"...it makes sense to align with SESAR, because we cannot invest at the same level as Europe."*

We also heard that we need to maintain a clear focus on our interests, value proposition and competitive points of difference.

Among domestic stakeholders there is a sense that we may be losing our edge and being left behind. There is also a view that, as with other parts of the system, outward engagement is happening in silos: what we learn overseas comes back into agencies (sometimes pockets within agencies) rather than adding to our national awareness and intelligence

Stakeholders here and overseas see opportunities for more strategic collaboration in our region and across the world. They suggest that doing so effectively will require a clear focus on our strengths and on the strategic outcomes we are seeking from the air navigation and aviation systems.

PHASE 2 FINDINGS

Aotearoa New Zealand needs to clearly define its distinctive interests and strengths

The proposed Flight Plan could articulate Aotearoa New Zealand's unique value proposition and the long-run outcomes it seeks and will use to measure performance.

Aotearoa New Zealand has previously exploited specific niches in ANS and aerospace development, such as with RocketLab, Airways International services and our previously world-leading regulatory development for uncrewed aircraft. This country has also been a successful testing ground for international eVTOL companies like Wisk.

We are well represented at international fora in policy, standards, workforce and industry bodies, and commercial groupings. New Zealanders are prominent on advisory panels to ICAO, the World Meteorological Organisation (WMO), at IATA's Asia Pacific office, and at international bodies representing airline pilots and air traffic controllers. The CAA is a regular participant in ICAO standard-setting processes and at international and regional fora on civil aviation regulation. The Panel is aware that international relationships also exist in many other areas.

These activities generate a strong international profile to leverage. The Panel has observed some good work promoting our natural cultural and geographical advantages. However, these advantages aren't unique to us. Other states will step into these spaces if we are not clinical in determining what to target, and why.

We have the opportunity to better coordinate and plan our international engagement...

The Panel found that there is no overarching plan for international engagement. While this country has undoubtedly done well to date, our view is that a more targeted approach explicitly aligned to our strengths and stated interests in international engagement, will serve us better in the future.

Maritime NZ's International Engagement Strategy is one example of a coordinating strategy.

Maritime NZ International Engagement Strategy

The Maritime NZ International Engagement Strategy 2018-2023 focuses on enabling Aotearoa New Zealand to influence international decision-making and enhancing our reputation as a responsible maritime participant, while taking an informed, evidence-based approach and managing obligations under maritime treaties.

The strategy provides a framework for prioritising engagement effort into 'Lead', 'Push', 'Follow' and 'Deliver' categories, based on the national interest and/or benefit to Aotearoa New Zealand.

While Maritime New Zealand has the lead, the strategy is designed to take a whole-of-system view, including active engagement with government agencies and industry.

... by developing purposeful partnerships for mutual benefit

The Panel's view is that future success will come from joining forces.

Where it makes sense to further our stated interests, partnerships can help navigate increasing interoperability and the sheer scale of the capability and investment required for system reset.

Our relatively smaller size and limited resources mean we need to be deliberate and strategic about what we choose to focus on, where we put our investment and who we partner with.

There are already examples of successful partnerships benefitting the air navigation system, offering models for a more comprehensive approach to identifying where we share goals and can 'piggy-back' on the larger resources and reach of other states.

SouthPAN partnership in Australasia

SouthPAN (Southern Positioning Augmentation Network) is a partnership between Toitū Te Whenua LINZ and Geoscience Australia to augment satellite positioning services and improve the accuracy and reliability of existing global navigation satellite systems. There are significant safety benefits to aviation through more precise positioning information. General aviation was particularly supportive of this technology and lobbied hard in support of New Zealand's investment.

SouthPAN is expected to unlock significant benefits for Australasia, including supporting aviation safety, crop management, tracking maritime shipments and enabling navigation for drones and other uncrewed aircraft. The quantified benefits are estimated at NZD$864m over 20 years. This value will increase as new applications are developed.

As pointed out by international commentators, there are existing models where states join up to enhance leverage.

We suggest that partnerships of this kind would benefit Aotearoa New Zealand in the future and should form part of engagement and investment planning.

COOPANS Alliance

COOPANS is an international partnership between the ANSPs of Austria (Austro Control), Croatia (Croatia Control), Denmark (Naviair), Ireland (Irish Aviation Authority), Portugal (NAV Portugal) and Sweden (LFV).

The COOPANS partners have adopted a common managerial approach, whereby six ANSPs act as one organisation together with a common industry supplier. Five of six have implemented the same software and air traffic management functionalities, to increase capacity, enable performance-based navigation and minimise overall costs for airspace users.

The Alliance has invested over €140m, saving airline customers (and passengers) in the region of €50m.

There are also clear risks in going it alone.

Airservices, Australia's ANSP, commissioned a replacement air traffic management platform to integrate military and civil aircraft operations and replace its aging existing platform. The original budget was AUD$1.22b with a delivery date of 2015. Currently scheduled to come online in 2026, Airservices estimates the final cost will be around AUD$4.11b. The platform has not been designed to integrate new capabilities.

… and sharing experience, expertise, and intelligence

Where we can learn, adapt and adopt policy and regulatory approaches from other states, we should aim to do so in the interests of efficiency, agility, harmonisation, and responsiveness.

As noted in our findings on workforce, the skills demanded by the current and future system are highly competed. We can readily increase access to those skills and increase the diversity of thinking in the ANS by seconding experts from overseas, based on the needs identified in the proposed workforce strategy.

In the words of one of our international commentators, we should *"focus on collaboration. The future for New Zealand is much more in a partnership approach to get and stay ahead. Think about what you can bring to the table."*

NEXT STEPS: TARGETED ENGAGEMENT BENEFITTING US AND OUR PARTNERS

An international engagement plan should be developed as a workstream under the Flight Plan, specifically focussed on strengthening strategic ties and building trust to support partnerships on issues of shared interest and opportunities for shared investment.

The refreshed NAPS and the Flight Plan should underpin a more targeted and coordinated approach to international partnering, engagement and competition, overseen by the proposed Aviation Council.

An integrated, coordinated system-wide approach in service of our defined strategic outcomes will ensure:

- investment in value-enhancing partnerships with key global and regional partners, including sharing regulatory expertise and jointly procuring and developing critical infrastructure
- protection of our sovereign airspace rights and interests as well as our obligations, commitments, and responsibilities under relevant international agreements
- that we remain competitive and relevant on the world stage, particularly with regard to the attraction of new entrants, inwards investment, and research and development; and
- delivery of consistent messaging abroad about Aotearoa New Zealand's distinctive value proposition, including valuing and protecting our indigenous culture and heritage.

Part three:
Implementation

3.1 SEQUENCING AND PRIORITISATION

Reset is urgent, and sequencing is critical

ANS stakeholders are ambitious for the future of the system. They understand the cost of doing nothing and that continuing the current piecemeal and short-term trajectory is not sustainable.

They also told us that many system players were innately conservative and lacking confidence about change. The attitudes and behaviours that make our system safe tend to mitigate against confident, collective change leadership.

As outlined above, the Panel's recommendations amount to a system reset, with likely significant funding and resourcing implications.

This will require a continuation of the stakeholder dialogue and joint working that has been so evident during this review, enabled by the new system leadership and strategy we suggest in recommendations 1 and 2.

Given current resource constraints and the significant interdependencies illustrated by this review, initial work on sequencing and prioritisation will be critical.

The recommendations do not all need to be implemented at once. The change and reset programme can be broken down into manageable component parts over short, medium, and long-term horizons.

Some of these would require the Government's mandate or approval, or they may be dependent on other work programmes moving ahead, such as implementation of the Civil Aviation Act and Te Manatū Waka Ministry of Transport's Enabling Drone Integration policy package.

But much of this work does not need to wait for a signal from Government. There are opportunities now for industry and agencies to take the initiative and gather momentum across the system to ensure we head in the right direction.

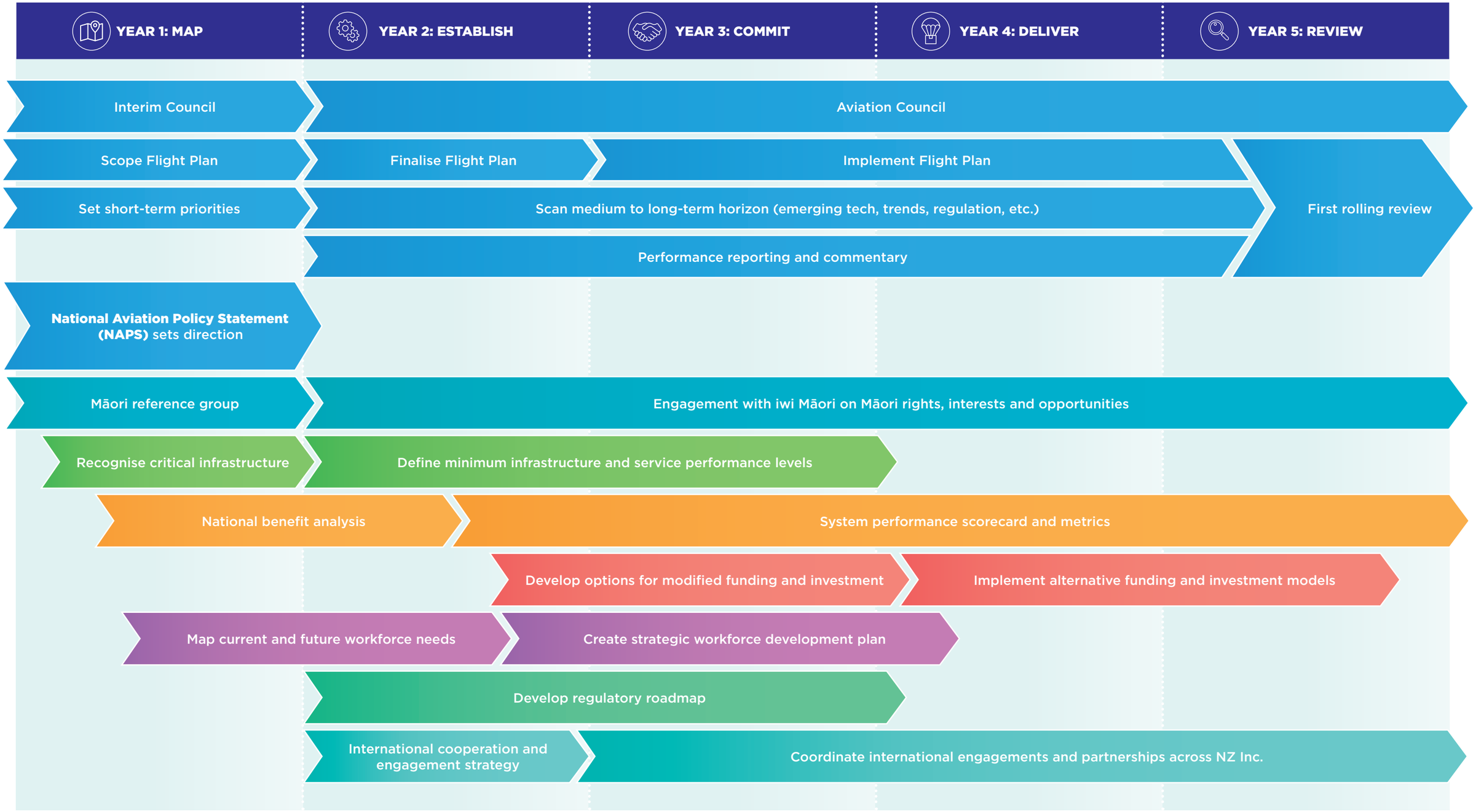
The Panel has provided an indicative guide for implementation

In general, the priority should be on getting the strategy, policy, and regulatory settings right. Changes to institutional, funding and investment settings can then follow, based on the priorities and expectations for the system agreed by the Government and industry.

Figure 5. (overleaf) provides the Panel's view of potential timing and sequencing of the change programme.

This is an indicative guide only, designed to cadence change across a five-year timeline and categorised into strategy, policy and regulatory, institutional, and funding settings. The new and collective system leadership arrangements we propose here will decide which of our recommendations to address and how to sequence them in a way that most effectively balances risk with opportunity.

Figure 5.
Sequencing and prioritisation



3.2
WHAT WILL SUCCESS LOOK LIKE IN FIVE YEARS' TIME?

The future system has the strategic leadership and workforce capability it needs to drive change

By 2028, investment in people and organisational capability has paid dividends. The best and brightest come to our shores, attracted by our reputation as an agile, innovative country that is open for business in the aviation and air navigation sectors.

Working within the National Aviation Policy Statement, the Aviation Council has created a shared strategic direction and the associated performance scorecard is well understood and ambitious.

As system leader, the Council has clearly articulated the required system-wide benefits and opportunities. It regularly signals the results of its horizon scanning and international perspectives.

System participants embrace change and opportunity. The foresight of new activity, planning and performance targets helps them to actively manage risks and balance them with opportunities to create value. Change is expected rather than feared, and disruptive technologies are valued for the opportunities they present.

There is space for agency staff to think strategically, in a way deliberately separated from the business-as-usual pressures of solving urgent problems.

Agency leaders are championing new and innovative ways of working to harness the workforce's full potential. Workers in turn are energised by the renewed sense of urgency, focus and direction. They have risen to the challenge and pivoted to more modern and agile ways of working.

Workplace culture has become more open, curious and adaptable. There is a diverse mix of skills across the system to balance short-term operational delivery with longer-term strategic planning and implementation.

The system is also starting to reflect the diversity in our society. People in the system are embracing te ao Māori perspectives to create a safer, more welcoming space for iwi Māori to participate and engage with Crown agencies. Greater numbers of Māori, Pasifika, women and ethnic communities are joining the workforce pipeline, which starts earlier and reaches into more remote regions and communities.

The workforce is also increasingly porous, with growing interchange of personnel between on and offshore partners, the regulator and the regulated, and industry, the wider sector, and government.

The regulatory system moves quickly to calibrate the level of risk to opportunity

By 2028, the regulatory system is driving forward, taking an anticipatory, adaptive regulatory approach.

Regulators think globally and act locally. They look up and out from the distractions of the here and now to anticipate decisions and resources that will be needed another five, ten and fifteen years down the track. They work with confidence across different regulatory domains and disciplines to develop solutions to new challenges that don't fit the mould.

The regulator has the resources it needs. It is getting ahead of the technology curve in the context of system-wide safety performance. It has strengthened its partnerships with industry, the wider sector, and other government agencies, and continued close links with fast-moving international partners.

Where appropriate, the regulator co-designs innovative approaches with regulated parties and is responsive to te ao Māori approaches to regulation.

Safety is an increasingly dynamic and nuanced concept, responding to a diverse range of users, technologies, and use cases. A mix of prescriptive and performance-based regulation is continuing to develop. Recognition and reliance on models developed overseas or in other regulatory domains is becoming increasingly common.

The system is constantly learning, evolving and under review. System performance indicators offer a sophisticated lead and lag picture of system safety, security and resilience to support strategic, long-term thinking and targeted enhancements. Big data analytics and intelligence provide answers to complex questions in real time.

Decision-makers value and invest in the system based on its importance to Aotearoa New Zealand and the region

Everyone in the system takes responsibility, and is held accountable, for prioritising system safety. The ANS is routinely recognised and resourced as part of critical national infrastructure.

A minimum operating network and level of service provision have been agreed and are sustainably resourced. The Government has set clear expectations for investment in maintaining lifeline utilities and delivering essential services.

System leaders, funders and investors know the cost of the system components and the returns they expect to see in the form of environmental, social, cultural, and economic benefits, informing future investment decisions. Macro level trade-offs are transparent. Communities see their needs and aspirations for air transport and regional connectivity as integrated into the wider national transport, health and civil defence networks.

Aotearoa New Zealand has a system-wide investment plan, based on current knowledge of the system's health. Investment is prioritised and sequenced, dealing with acute risks first. Funding gaps have been identified and addressed.

Planning for major system upgrades is now being done well in advance to leverage opportunities to partner with other states to access capital where required. This gives agencies and investors the confidence to embark on high-cost capital projects and system users the confidence to know that their fees are being used wisely.

The system is funded sustainably through the medium to long term. User pays is complemented by Crown funding in the public good elements of the system, whilst a parallel capital investment approach pursues growth and innovation opportunities. SOE and Crown entity boards take a holistic approach to performance based on environmental, social and governance principles.

The national climate change response supports Crown and private investor confidence for long-term decisions toward a decarbonised and climate-resilient future.

We know the value of ANS to Aotearoa New Zealand, the Pacific region, and global aviation. Leaders and the public are justly proud of the aviation sector's commitment to sustainable growth and development.

SUMMARY OF RECOMMENDATIONS

RECOMMENDATION 1:

Drive system leadership, direction and performance through:

- A ministerially appointed **interim and permanent Aviation Council** with whole-of-system oversight responsibilities
- A new and long-range **National Aviation Policy Statement (NAPS); and**
- **A Flight Plan for Aotearoa New Zealand:** a medium-term direction for aviation and air navigation.

RECOMMENDATION 2:

Protect the **air navigation system infrastructure, services, and connections** that are critical to national safety, security and resilience through:

- **defining the minimum operating network, service provision and performance standards** for national safety, security, and essential service connections; and
- **decoupling critical infrastructure and service provision from dependence on user-generated revenue**.

RECOMMENDATION 3:

Build a picture of the **air navigation system's contribution to the national benefit** by articulating and measuring the system's current and potential contribution, including social, environmental, economic, and cultural outcomes.

RECOMMENDATION 4:

Create accountabilities for system-wide performance and benefit delivery using a **system scorecard**.

RECOMMENDATION 5:

Develop a workforce strategy, in support of the Flight Plan, to **map and close the gap between current and future workforce** diversity, culture, capacity and capability.

RECOMMENDATION 6:

Engage proactively and deliberately with iwi Māori to explore and give effect to rights, interests, and opportunities in the air navigation system.

RECOMMENDATION 7:

Strengthen the system's regulatory infrastructure by:

- **developing a detailed regulatory roadmap**, based on the CAA delivering its 2022-2027 Regulatory Safety and Security Strategy[28] and aligned with the Flight Plan; and
- **ensuring the regulator has the capabilities, capacity, and sustained resource** to meet its own and system strategic goals.

RECOMMENDATION 8:

Drive investment into the system through:

- retaining **user pays** as the base funding model;
- **additional and targeted Crown investment** in critical infrastructure, major capital projects, and research and development (the concept of **user pays plus**); and
- opening options for **alternative sources of capital**.

RECOMMENDATION 9:

Leverage our relationships to influence the international agenda and further Aotearoa New Zealand's sovereign interests.

28. Accessible at: https://www.aviation.govt.nz/assets/publications/CAA-Regulatory-Strategy-2022-27-Summary.pdf

Annexes

List of Annexes

ANNEX 1. GLOSSARY

Airways	Airways Corporation of New Zealand, the air navigation service provider
AITP	Airspace Integration Trials Programme
ANSP	Air navigation service provider(s) – an organisation(s) authorised by the safety regulator to provide air traffic management services and infrastructure
ANSR	Air Navigation System Review
ATC	Air traffic control
ATM	Air traffic management
CAA	Civil Aviation Authority, the civil aviation regulator for Aotearoa New Zealand
CASA	Civil Aviation Safety Authority Australia
CAA United Kingdom	Civil Aviation Authority United Kingdom
CNS	Communication, Navigation and Surveillance
ATS	Air traffic services/Air traffic controllers
ICAO	International Civil Aviation Organization – the United Nations agency responsible for setting global standards and recommended practices for civil aviation, established by the Chicago Convention (1944)
LINZ	Toitū Te Whenua Land Information New Zealand
MBIE	Ministry for Business, Innovation and Employment
MET	Meteorology i.e., meteorological services for air navigation
MoT	Te Manatū Waka Ministry of Transport
NAP	The 2012 National Airspace Policy of New Zealand is the most recent statement of government policy, focusing on development and modernisation of airspace and the ANS and providing a framework for the National Airspace and Air Navigation Plan delivered under NSS
NATS	The United Kingdom's main air navigation service provider
NSS	New Southern Sky 2014, a ten year, three stage, programme led by the CAA to modernise New Zealand's air navigation system
NZAA	New Zealand Airports Association
NZDF	New Zealand Defence Force
PBN	Performance-based navigation. Aircraft that meet performance requirements can fly more direct and accurate routes using satellite-based navigation systems
SAR	Search and Rescue
SESAR	Single European Sky ATM Research, a collaborative project and public-private partnership to overhaul European airspace and its ATM
SBAS	Satellite-based augmentation system
SOE	State-owned enterprise

ANNEX 2. SCOPE OF THE AIR NAVIGATION SYSTEM

Air navigation system map: ANSR Terms of Reference

ANNEX 3. PRINCIPLES AND STRATEGIC OBJECTIVES FROM PHASE 1 REPORT

ANNEX 4. INTERNATIONAL COMPARISONS

In part 2.8, we discuss the concept of 'stealing with pride.'

In that spirit, the Panel has looked at models being used overseas to face the changes being forced by global disruption. We are certainly not alone in looking ahead.

The United Kingdom

Flightpath to the Future (2022) is the United Kingdom Government's ten-point plan for the future of United Kingdom aviation. The plan was driven by the need to build back from the impacts of COVID and Brexit, and to set the strategic framework for growth over the next ten years.

A newly created **Aviation Council** will support implementation of the plan. Co-chaired by the Aviation Minister and a sector representative, the Council will monitor progress and coordinate with existing initiatives. It will provide system-level oversight and accountabilities.

Wide representation and a clear mandate offer a good option for environments that will involve trade-offs between agency interests, where the impacts of decisions about the system are wide and complex.

NATS United Kingdom also described the 24-month process for developing its future strategy.

Australia

The **Australian Government** is developing an **aviation white paper** to "... examine the government policy and economic reforms necessary to promote efficiency, safety, sustainability and competitiveness of the aviation sector out to 2050."

The project has an AUD$7 million budget and is led by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. It will cover:

- aviation's role in economic development and trade
- maximising aviation's contribution to achieving net carbon zero
- future industry workforce skills and training requirements
- maintaining fit-for-purpose aviation safety, air navigation and aviation security systems
- the role of airlines and airports in supporting regional economies.

A preliminary **Green Paper** is due in mid-2023, followed by the White Paper in mid-2024. The terms of reference are available here.

Canada

The Panel also heard from **NAV CANADA** on strategic decisions to consolidate its interests and investments. NAV CANADA's strategic direction is focused around three interconnected initiatives: trajectory-based operations; airspace modernisation; and digital facilities.

Its tripartite board structure – government, industry and workforce – aims for good governance, diversity of skills and experience, and reflecting stakeholder and consumer perspectives. The board is focused on future international interoperability, digital data-sharing and partnerships with technology developers and others in the supply chain to manage growth, reduce emissions and reduce delay.

ANNEX 5. PANEL MEMBER BIOGRAPHIES

Debbie Francis, Chair

Debbie is an independent consultant specialising in strategy development, organisational culture and change management.

She has held executive roles in PwC New Zealand's Government and People and Change consulting practices, the New Zealand Correspondence School and as a two-star General equivalent in the New Zealand Defence Force.

Debbie was a lead reviewer for the State Services Commission and has undertaken several similar reviews of private sector companies and public agencies, most recently of the New Zealand Police and New Zealand Parliamentary workplaces.

She lives on a truffle farm in Waipara, has six children, six grandchildren and three cats.

Howard Fancy

Howard has extensive experience at the centre of government in the formulation, delivery and operation of policy as well as stakeholder engagement, including partnering with iwi/Māori.

He brings a strong strategic and systems focus, having led a wide range of major reforms and reviews that have redesigned institutional arrangements, capabilities and relationships and positioned agencies for future change and opportunities. He served as the Chief Executive of the Ministries of Commerce, Education and Environment and is currently a member of several public sector audit and risk committees.

Howard lives in Wellington with his family.

Ed Sims

Ed has an extensive background and brings a depth of knowledge in aviation, air navigation service provision and airline management operations.

He was CEO of Airways (2011-2017), an executive committee member and then Chair of the global air traffic control governing body CANSO (2012-2017), a member of the Air New Zealand executive team (2006-2010) and has recently returned from running Canada's second largest airline WestJet for the last five years.

Ed has held governance roles in the New Zealand tourism sector, has sat on public sector agency audit and risk committees and is a member of the Business Council of Canada.

He lives in Auckland with his family.

Danny Tuato'o

Danny Tuato'o (Ngāpuhi) was admitted as a barrister and solicitor of the High Court of New Zealand in 2005. In addition to his legal expertise, Danny has significant leadership experience as a business owner in New Zealand, a director in the public and private sectors and as a senior manager in law and education.

He is currently a Partner in a Northland provincial law practice and a member of the boards of Fire and Emergency New Zealand and Maritime New Zealand. Proficient in te reo Māori, Danny also volunteers for the Coastguard New Zealand Board and is actively involved in Kiwi recovery and pest control projects in Northland.

He lives with his wife and four children in Whangārei.

ANNEX 6. NGĀ RAU O TE AO HOU MEMBER BIOGRAPHIES

Mō te Rōpū | About the Group

Ngā Rau o te Ao Hou is a Māori reference group, established to support the Air Navigation System Review Panel and Secretariat to weave in iwi Māori values and interests throughout the review. This includes advice on the system from a te ao Māori perspective, as well as partnership and engagement with Māori in good faith according to the principles of Te Tiriti o Waitangi.

The members of Ngā Rau o te Ao Hou don't claim to speak on behalf of any iwi, hapū or rūnanga, but rather as individuals with expertise across aviation and air navigation, te ao Māori and a shared commitment to upholding Te Tiriti partnership for the benefit of all Māori.

Ngā Mema | Members

Mahanga Maru (Chair)
Ngāti Porou

Mahanga is the founder of Maru Consulting and the Tairāwhiti-based scenic flight airline, Air Ruatoria. He has previously held senior executive roles in the public sector and post-settlement iwi organisations, including roles as Director and Chair of a primary health organisation and a Māori SME business network.

He has led the development of Māori strategies in several organisations and has designed and led successful consultation processes with iwi. Training has been part of Mahanga's professional life in one way or another since qualifying in 1990 as a flight instructor whilst a commercial pilot.

Mahanga spends his time between Te Whanganui-a-Tara and Tairāwhiti.

Andrew (Andy) Boyd
Ngāti Porou

Andy is an experienced senior manager, aviation expert and long-serving air traffic controller.

He has spent almost two decades at Airways, Aotearoa New Zealand's air traffic control and air navigation service provider, where he has held a number of senior positions, including as Manager, Operations – Service Delivery, Manager, Development Support and Manager, Terminals – Service Delivery.

In addition to ensuring safe and efficient domestic air traffic services at Airways, Andy has been responsible for performance management relating to day-to-day operations; customer support and solutions; and product development with a focus on new technologies, products and services.

Andy lives with his whānau in Ōtautahi.

Ngaa Rauuira Puumanawawhiti

Ngāti Kahungunu, Ngāti Raukawa, Ngāi Tūhoe

Ngaa Rauuira has worked across various fields of public policy, Māori-Crown relations, cultural marketing, research and communications.

His key interests are in the areas of education, Te Tiriti and constitutional transformation, shaped under the mentoring of the late Māori indigenous rights lawyer Moana Jackson.

At the age of 13, Ngaa earned his first university degree from Te Wānanga o Raukawa. At age 16, he travelled to the United States to study law and politics at Yale University's summer school. His significant educational achievements were the subject of a 2011 feature-length film, *Māori Boy Genius*, which has gone on to receive international praise.

Ngaa lives in Te Whanganui-a-Tara.

Angela Swann-Cronin

Ngāti Porou, Rongowhakaata

Angela became the first wāhine Māori pilot in the Royal New Zealand Air Force in 1997, where she was deployed all over the world from Afghanistan to Canada and Antarctica.

Her extensive military training included engaging in Weapons and Nuclear Biological Chemical Warfare training, defensive aircraft manoeuvres, tactical airfield research, flight planning through foreign airspace and working alongside coalition forces.

She retired from the RNZAF in 2009 and now flies the Q300 around Aotearoa as an Air New Zealand pilot. Angela also works with several worldwide groups to encourage the next generation of female pilots and advocate for positive change in male-dominated industries.

Angela lives in Rotorua with her whānau, including husband Anton, who is an air traffic controller, and two sons Nīkau and Tai.

ANNEX 7. STAKEHOLDER REFERENCE GROUP

- Air New Zealand
- Airways Corporation
- Airways International
- Auckland International Airport
- Auckland Rescue Helicopter Trust
- Aviation Federation
- Aviation New Zealand
- Board of Airline Representatives NZ
- Boeing
- Christchurch International Airport
- Civil Aviation Authority
- Dawn Aerospace
- Department of Prime Minister and Cabinet
- E Tū
- Fire and Emergency NZ
- Toitū Te Whenua Land Information New Zealand
- Merlin/Christchurch Aerospace
- MetService
- Ministry of Business, Innovation and Employment
- Te Manatū Waka Ministry of Transport
- National Emergency Management Agency
- NZ Airline Pilots Association
- NZ Airports Association
- NZ Defence Force
- Rotorua Airport
- Tāwhaki Joint Venture
- Transport Accident Investigation Commission
- The Treasury
- UAVNZ
- Wellington International Airport
- Wisk

HE AROTAKE I TE PŪNAHA TERE-RANGI

AIR NAVIGATION SYSTEM REVIEW

TĒNĀ RAWA ATU KOE
THANK YOU

WWW.ANSR.TRANSPORT.GOVT.NZ

Te Kāwanatanga o Aotearoa
New Zealand Government