MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

BRIEFING

Establishing a programme of airspace integration trials

Date:	12 December 2018	**Priority:**	High
Security classification:	In Confidence	**Tracking number:**	2052 18-19

Action sought		
	Action sought	**Deadline**
Hon Dr Megan Woods **Minister of Research, Science and Innovation**	**Agree** to the establishment of a programme of airspace integration trials as outlined in this paper **Forward** to Hon Phil Twyford, Minister of Transport, for discussion **Forward** to Hon David Parker, Minister for Economic Development, for his information.	17 December 2018

Contact for telephone discussion (if required)				
Name	**Position**	**Telephone**		**1st contact**
Dr Peter Crabtree	General Manager, Science, Innovation and International	04 901 3907	Privacy of natural persons	✓
Dr Kjesten Wiig	Director, Innovative Partnerships	04 901 3959	Privacy of natural persons	
Michelle Schulz	Strategic Partnership Manager, Innovative Partnerships	04 901 2135	Privacy of natural persons	

The following departments/agencies have been consulted
Ministry of Transport, Civil Aviation Authority, and Airways Corporation

Minister's office to complete:

- ☐ Approved
- ☐ Noted
- ☐ Seen
- ☐ See Minister's Notes
- ☐ Declined
- ☐ Needs change
- ☐ Overtaken by Events
- ☐ Withdrawn

Comments

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Establishing a programme of airspace integration trials

Date:	12 December 2018	**Priority:**	High
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Purpose

Seek agreement to the establishment of a programme of airspace integration trials to enable the safe development, testing and market validation of advanced Unmanned Aircraft (UA) applications within the existing regulatory framework.

Executive Summary

In September 2018 you agreed to progress the development of the *Advanced Aviation Technologies* platform-play. The objective is to develop New Zealand's competitive advantage as a location of choice for the emerging UA sector.

As a key action under the platform-play, this paper proposes to establish a programme of airspace integration trials to enable the safe development, testing and market validation of advanced UA applications within the existing regulatory framework. The programme will complement the broader Ministry of Transport (MOT)–led work on developing a credible and robust pathway to UA integration. The intent is to:

- stimulate New Zealand's UA industry development, innovation and research and development (R&D), attract globally leading firms and innovators, and support local ambitions
- support the MOT-led UA integration work by informing the development of policy, operational and technological requirements needed to enable UA integration
- build social licence (both with the public and existing airspace users)
- connect internationally with our strategic science and innovation partners and like-minded regulators to share best practice approaches to regulating UAs.

The programme does not involve direct financial incentives. The value is in bringing together selected UA industry partners and local government entities (councils and regional economic development agencies) under one coordinated multi-agency programme-managed framework that pro-actively supports airspace integration trials.

The overall programme management would be provided by the Ministry of Business, Innovation and Employment (MBIE), and the safe and effective delivery supported by the key relevant agencies: MOT, Civil Aviation Authority (CAA) and Airways Corporations (Airways). As the overall programme manager, MBIE will regularly inform the inter-agency leadership group that also oversees the broader MOT-led work on UA integration, and discuss any opportunities and challenges as they arise.

It is important to note that as the regulator, the CAA will contribute to the programme where appropriate, maintaining a degree of independence as it will need to certify operators taking part in the trial programme.

We propose to take a portfolio approach to select the airspace integration trials within the scope of the programme. This would enable us to focus on different use-categories and operations of

advanced UA applications over time (services, cargo, and passenger in different types of low and high density environments).

Building on Zephyr Airworks' (Zephyr) current activities in New Zealand, we recommend to commence the programme with the development of airspace integration trials to enable Zephyr's testing and market validation activities Commercial Information, Information recieved in confidence We also seek agreement to engage with select domestic and international industry and local stakeholders on the potential development of trials to provide a proof of concept for cargo transportation and other UA services.

The development and delivery of safe and efficient airspace integration trials is complex. If you agree, we will work closely with MOT, CAA and Airways and the inter-agency leadership group, and consult with key stakeholders, to further inform programme design and approach to develop and deliver the specific airspace integration trials. We intend to report back early next year with further advice and next steps. We will also provide you with further advice on risks and mitigations identified in this paper.

We recommend you forward this paper to Hon Phil Twyford, Minister of Transport for discussion, and Hon David Parker, Minister for Economic Development for his information.

Recommended action

The Ministry of Business, Innovation and Employment recommends that you:

a. **Agree** to the establishment of a programme of airspace integration trials to enable the safe development, testing and market validation of advanced UA applications within the existing regulatory framework

Agreed / Disagreed

b. **Note** that no direct financial incentives will be provided under the programme, the value of the programme is in the coordinated multi-agency programme-managed framework that pro-actively supports airspace integration trials

Noted

c. **Agree** that the we take a portfolio approach to select the specific airspace integration trials within the scope of the programme

Agreed / Disagreed

d. **Agree** that, building on the activities that Zephyr has already been conducting in New Zealand we commence with the development of airspace integration trials to enable Zephyr's testing and market validation activities Commercial Information, Information recieved in confidence

Agreed / Disagreed

e. **Agree** that we also engage with select domestic and international industry and local stakeholders to develop airspace integration trials to provide a proof of concept for cargo transportation and other UA services

Agreed / Disagreed

f. **Note** that the relevant agencies (MOT, CAA, Airways) will support the programme and multi-agency approach

Noted

g. **Note** that as the regulator the CAA will contribute to the programme where appropriate, maintaining a degree of independence as it will need to certify operators taking part in the trials

Noted

h. **Note** that if you agree to the recommendations above, we will work closely with MOT, CAA and Airways and consult with key stakeholders on programme design and the approach to develop and deliver the airspace integration trials (including risks and mitigations), and report back early next year

Noted

i. **Forward** to Hon Phil Twyford, Minister of Transport, for discussion

Yes / No

j. **Forward** to Hon David Parker, Minister for Economic Development, for his information.

Yes / No

Dr Kjesten Wiig
Director, Innovative Partnerships
Science, Innovation and International
MBIE

..... / ..... / .....

Hon Dr Megan Woods
Minister of Research, Science and Innovation

..... / ..... / .....

Background

1. In September 2018, you agreed and discussed with Hon Phil Twyford, Minister of Transport the development of the *Advanced Aviation Technologies* platform-play. The platform-play's objective is to develop New Zealand's competitive advantage and position as the location of choice for the emerging unmanned aircraft (UA) sector. It comprises a series of actions specifically targeted at the needs of companies developing, testing and commercialising advanced UA applications. The overview provided to you in September is attached at Annex One [0346 18-19 refers].

2. As a key action under the platform-play, this paper provides advice on the establishment of a programme of airspace integration trials to enable the safe development, testing and market validation of advanced UA applications within the existing regulatory framework.

3. The platform-play and the programme proposed in this paper complement and help inform the Ministry of Transport (MOT)-led inter-agency work on the development of a UA integration paper which presents the vision of a thriving, innovative and safe UA sector. MOT has recently concluded a public engagement on a draft of the UA integration paper, and a final version is scheduled with Cabinet early next year.

Rationale, objectives and overall approach of the programme

UA integration is essential to enable a thriving, innovative and safe UA sector

4. As previously discussed, integration of UA into national airspace is complex. It requires technologies and infrastructure to enable beyond visual line of sight (BVLOS) operations and UA with the functional capabilities to operate safely alongside other users.

5. The MOT–led UA integration work is focussed on developing a credible and robust pathway to UA integration. To achieve this, MOT is leading the development of a multi-year work-programme based on four interconnected pillars: regulation, funding and investment, infrastructure and technology, and research and development (R&D).

6. Under the regulation pillar, MOT and the Civil Aviation Authority (CAA) have undertaken scoping work on potential short- to medium-term updates to UA rules to address current and emerging safety and security risks, enable innovation and lay the groundwork for future integration. This is a large and complex programme of work that will require additional resource to complete in a timely manner and is a key component of the UA initiative in the Budget 2019 "Enabling Innovation" package [1518 18-19 refers].

7. Also critical is the CAA-led New Southern Sky (NSS) Programme. Established in 2014, NSS is a multi-agency programme to modernise all aspects of the aviation system. The most significant aspect is the move from land-based airspace and air navigation systems to space-based satellite navigation and surveillance.

Safe and effective development, testing and market validation activities are needed to define a credible and robust pathway to UA integration

8. The development of a credible and robust pathway to integration of UA into the national aviation system depends on the safe and effective development, testing and certification of many new and unproven technologies.

9. Since Zephyr Airworks (Zephyr) announced their presence in New Zealand there has been an increasing interest from industry (domestic and international) and local government entities (councils and regional economic development agencies) to develop, test and conduct market validation activities of advanced UA applications.

10. This creates a unique opportunity to support UA industry capability development, inform the development of a credible and robust pathway to UA integration, and position New Zealand as a location of choice for the emerging UA sector.

We can do more to make the most of the presenting opportunities and strengthen our current competitive advantage

11. As noted in previous advice, Europe and Singapore are making significant investment in resources and funding and putting in place innovative initiatives (such as demonstration pilots) to enable the development of a UA sector [0346 18-19 refers].

12. Our risk-based and tailored regulatory approach has proven flexible and effective enough to enable testing of advanced UA like Zephyr's prototype Cora. This has positioned the CAA as a leader within the international context.

13. However, the approach we take to certification is only one component of what industry needs to safely and efficiently develop, test and conduct market validation activities. Access to test sites and airspace, air traffic management and interfaces with relevant local stakeholders (General Aviation Community, general public etc) and agencies are also needed.

We propose to establish a programme of airspace integration trials to enable the safe development, testing and market validation of advanced UA applications within the existing regulatory framework

14. With the establishment of a programme of airspace integration trials within the existing regulatory framework we intend to:

- stimulate New Zealand's UA industry development, innovation and R&D, and attract globally leading firms and innovators – which in turn would generate regional and national economic benefits
- support the MOT-led UA integration by informing the development of policy, operational and technological requirements (eg UA traffic management system (UTM), detect and avoid technologies) needed to enable full UA integration
- build social licence (both with the public and existing airspace users)
- connect internationally with our strategic science and innovation partners (eg Singapore and Germany) and like-minded regulators to share best practice approaches to regulating UAs.

The value of the programme is in the pro-active multi-agency approach

15. No direct financial incentives will be provided under the programme. Our engagements to date indicates that for the emerging UA sector the ability to be involved in a programme that provides a safe and efficient pathway to BVLOS operations from development to market validation is is what is valued the most.

16. The programme will bring together selected UA industry partners and local government entities (councils, regional economic development agencies) under one coordinated, multi-agency, programme-managed framework that pro-actively supports airspace integration trials.

17. MBIE will provide the overall programme management. The safe and effective delivery supported by the key relevant agencies. MOT will provide policy input as and when required. Airways will support the necessary airspace management, building on their existing UTM testing and trialling activities (eg the pilot trial initiated with Auckland Council). CAA will ensure safety and regulation of the activities through certification of the operations.

18. It is important to note that as the regulator, the CAA will contribute to the programme where appropriate, maintaining a degree of independence as it will need to certify operators taking part in the trials. There is an existing and complex system with multiple different airspace users and any activity envisioned cannot introduce new risk without appropriate mitigation that satisfies the Director of the CAA.

19. As the overall programme manager, MBIE will regularly inform the inter-agency leadership group that also oversees the broader MOT-led work on UA integration, and discuss any opportunities and challenges as they arise.

Proposed scope of the programme

There are a number of different UA applications use-categories and operations

20. As indicated in previous advice, there is increasing investment and interest in the development and adoption of UA capable of transporting passengers and cargo and performing a wide range of other complex services. A high-level overview of use-categories and operations is provided in Table One below.

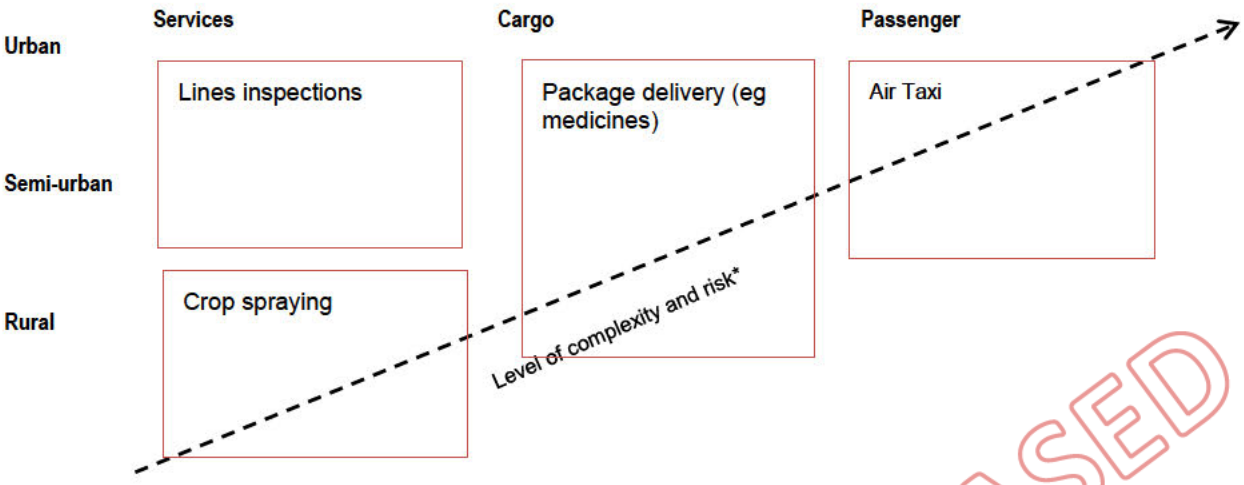
Table One: UA applications use-categories and operations descriptions

Category	Sub-Category	Operations description
Transport: UA operations where the purpose is the movement of a commercially-viable payload from one point to another	Passenger	Involves the movement of people to and from the same location (A-to-A), or to one or more locations (A-to-B)(eg air-taxis or other passenger-carrying concepts). *
	Cargo	Involves the movement of goods and freight from A-to-B (eg bulk or package freight, or delivery of mail, medicines and products).*
Services: UA operations where the purpose of the flight is executed during the flight, using sensors or on-board equipment.	Commercial	Involves a broad range of complex tasks (eg telecommunications; LiDAR, spectral imaging; mapping; asset inspection-; surveying; agricultural and scientific analysis). These operations may be A-to A or A-to-B and may require manoeuvring or 'working' in a specific area or location. *
	Civil	Involves the use of UA to support the activities of civil and public sector agencies (eg civil defence and emergency management; disaster relief; police and national security work; surveillance of national critical infrastructure, lifelines and assets). These operations may be A-to A or A-to-B and may require manoeuvring or 'working' in a specific area or location. *
		** For each use-category, the operations could be conducted within line of sight of the operator (VLOS) or BVLOS. The regulator may choose to define a middle category of extended visual line of sight (EVLOS).*

21. Depending on the environment (urban, semi-urban and rural) and types of operations, the different use-categories present different levels of complexities and risks, and will have different requirements in terms of development and testing airspace, final operating airspace integration, certification, airspace management, infrastructure, and interfaces with relevant local stakeholders and agencies.

22. The transportation of passenger and cargo and the performance of complex services from A-to-B BVLOS are the more advanced UA applications (Figure One, overleaf).

Figure One: Examples of UA applications use-categories



*The level of complexity and risk increases depending on whether operations are A-to-A or A-to-B and (e)VLOS or BVLOS.

We propose to take a portfolio approach to select the airspace integration trials within the scope of the programme

23. We propose that the programme include a portfolio of airspace integration trials. This would enable us to:

- pro-actively target specific domestic and international UA developers and operators focused on different advanced UA applications use-categories and operations, and be more responsive to presenting opportunities and emerging industry needs
- optimise the trials for different locations, matching locations and environments to suit the capabilities, needs and operating intent of UA developers and operators
- consider the phasing of the trials over time taking into account the different stages of each project's life cycle (from innovation and experimental testing to certified in-service operations)
- use the learnings of one trial to inform the development of the other trials in the portfolio.

24. To select the portfolio, we propose the following criteria:

- the UA developer and operator (domestic and international) is credible with a clear development, testing and market validation plan and evidence of, willingness to invest and build a sustained presence in New Zealand (eg job creation)
- local government entities are supportive of the trial
- the UA application could offer outcomes beneficial and useful to New Zealand
- the trial will support New Zealand's vision of a thriving, innovative and safe UA sector, and position us a location of choice for the emerging UA sector.

We recommend to commence with the development of airspace integration trials to enable Zephyr's testing and market validation activities in urban environments

25. Commercial Information, Information recieved in confidence

26. Commercial Information, Information recieved in confidence

27. Commencing the programme with Zephyr will enable us to leverage on its existing activities in New Zealand and help with the development of other potential trials in the portfolio.

We also seek agreement to engage with a selected industry and local stakeholders to explore the development of airspace integration trials for cargo transportation and other UA services

28. Based on our engagements to date, there are a number of credible domestic and international UA developers and operators that would have an interest in airspace integration trials for UA cargo transposition and other UA services.

29. Commercial Information

30. We intend to consult with industry (domestic and international) and local government stakeholders to assess whether there is value in, and it would be feasible to, include their development, testing and market validation activities within the portfolio of trials in the programme.

Defining the approach to development and delivery

The development and delivery of safe and efficient airspace integration trials is complex

31. Based on our assessments to date, for the delivery of the specific integrated airspace trials within the scope of the programme the following are required:

- full business case by the UA developer and operator describing their approach to developing their particular capability and use context, including a plan for progressing from innovation and experimental testing to certified in-service operations
- regulatory support and information for participating organisations on safe flight operations, acceptable test programmes and certification pathways
- identification and establishment of test locations to allow operators to test and build competencies in an area that matches their needs
- engagement with local community and existing airspace users.

Further work is needed to define the approach to development and delivery

32. To ensure that the trials are safe and efficient, and the results credible and internationally respected, we propose the following principles to define the approach to development and delivery of the trials. The trials will:

- be co-designed with key industry partners selected to provide a stepped approach into the New Zealand market
- be clear about the different roles and responsibilities, take into account any existing initiatives and opportunities, and manage interdependencies and expectations

- be safe and secure, requiring participants to obtain and comply with the relevant safety certification, security and regulatory requirements
- not unfairly disadvantage existing aviation participants
- be evidence-based
- when appropriate, provide opportunities for future international collaborations with our strategic science and innovation partners and like-minded regulators.

We propose to consult with key industry and local stakeholders to inform the further design of the programme

33. Working closely with MOT, CAA and Airways and the inter-agency leadership group, we in intend to consult with Zephyr and other selected industry (domestic and international) and local stakeholders to assist us in further defining:

- the roles and accountabilities of UA developers and operators, local government entities and central government
- the design and implementation of enabling mechanisms (such as memoranda of understanding and contracts) and how they will be standardised, interconnected and formalised
- a roadmap of the phasing and timing of trials taking into account each stage of the design life-cycle: from innovation and experimental testing to certified in-service operations
- the programme management requirements, and how these may change over time (including the costs)
- the information requirements, for example whether there is a need for guidance material on certification requirements
- the certification requirements, including the demand on CAA's resources
- the infrastructure requirements, including the identification and establishment of test zones, and airspace management
- the interrelationships with other key related work under way, in particular the CAA NSS programme, the MOT-led UA integration work, and the work Airways is undertaking on UTM
- the potential opportunities to partner and connect with other jurisdictions establishing similar initiatives (eg Germany and Singapore)
- how the success of the programme will be evaluated and how long the programme will be needed for.

Risks and mitigations

34. As noted above, the presence of Zephyr and resulting increasing interest in New Zealand as location for the development, testing and market validation of advanced UA provides us with a unique opportunity to support UA industry capability development and inform the development of a credible and robust pathway to UA integration. The programme provides the means to safely and effectively realise this opportunity and to strengthen our current competitive advantage. The programme also poses a number of risks.

For the programme to succeed, it is important that there is ongoing commitment to the selected trials

35. Based on our experience with Zephyr, depending on the complexities and the phase of development, each trial could require up to two-three years. As noted above, we intend to undertake further work on the approach to development and delivery of the programme, including how long the programme will be needed for and what the resource implications for relevant agencies will be.

36. MBIE can resource the project management for the establishment of the programme Confidentiality of advice to Government but ongoing support for the further years is contingent on baselining of the Innovative Partnerships programme appropriation as part of the RSI Budget package. Ongoing support from the CAA and MOT is also contingent on the success of the UA initiative in the Enabling Innovation Budget package led by the Minister of Transport.

It is also important that public perceptions and participants expectations are carefully managed

37. There may be a risk that the programme be perceived by other airspace users or the public as favouring selected industry participants. This risk can be managed though appropriate communications and by being transparent as to the selection criteria, and the approach to development and delivery of each trial.

38. There may also be a risk that UA developers and operators participating in the trial expect to receive preferential treatment to achieve certification. Another risk is that operators may find it too challenging to obtain certification (eg providing a safety case to conduct BVLOS operations that is acceptable to the CAA). These risks can be mitigated by providing clear information to trial participants on certification requirements and likely timeframes to achieve certification.

Next steps

39. We recommend you forward this paper to Hon Phil Twyford for discussion.

40. We will work closely with MOT, CAA and Airways and the inter-agency leadership group and consult with key stakeholders to further define the approach to development and delivery of the trials. We intend to report back early next year with further advice and next steps. An indicative timeline is attached at Annex Two.

Annexes

Annex One: *Advanced Transport Technologies* platform-play – overview discussed in September

Annex Two: Indicative Timeline

Annex One: *Advanced Transport Technologies* platform-play – overview discussed in September

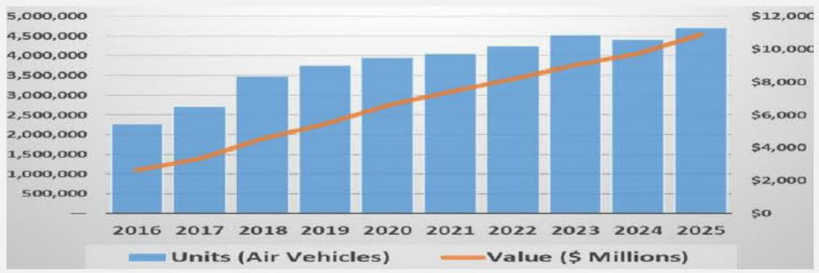
Advanced Transport Technologies *platform-play*:

Positioning New Zealand as the location of choice for the emerging global unmanned aircraft (UA) sector

Why the UA sector?

The UA sector is **growing and future-focused …**

Globally, **small and short-range** UAs, aka **drones,** have become more and more common for **commercial and recreational uses**



UAs capable of carrying passengers and cargo are becoming a reality

The emerging UA sector has the potential to **transform how we move goods and people, and how services are being delivered** across a range of public and private sectors.

Amir Husain, CEO of SparkCognition, "largest new market in our lifetimes."

… innovative and R&D intensive

Start-ups are currently the main actors within this sector.

$3 billion in funding to start-ups over the past five years

Technology leaders, large traditional aviation and car companies are also investing in these new technologies

Key focus areas for R&D investments are in:

- Aviation technologies (eg positioning, detect and avoid, and air traffic management)
- Other technology areas (eg batteries, software, Artificial Intelligence, sensors and lightweight materials, and data analytics)

How can we develop our competitive advantage?

We have a **unique opportunity …**

- We have an risk based UA regulatory regime and internationally reputable safety regulator
- We provide a microcosm to develop and bring these technologies to market
- We are a good place to conduct and invest in R&D
- We have some existing capabilities

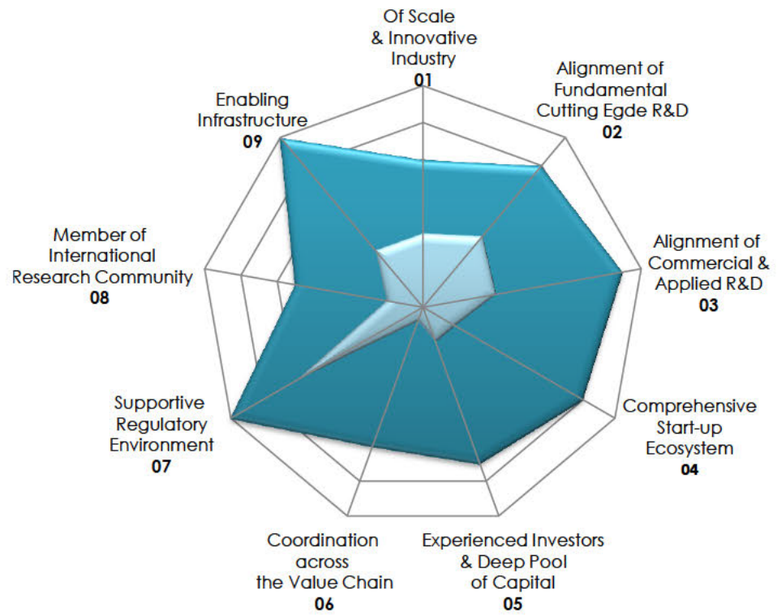
to realise it :

- We need a clear vision and a pathway for UA integration in a way that manages safety, security, and public acceptance
- Increasing international competition means we need to be fast and nimble
- We need to build specific R&D capabilities and talent, and support our domestic industry to develop

The Ministry of Transport is leading the development of a vision for safe integration of UAs in New Zealand

The platform-play is nimble and bespoke, with specific concrete actions that are specifically targeted at the needs of the emerging UA sector:

FOCUS AREAS & ACTIONS	
Ensure that our regulatory regime and approach continues to safely support this highly innovative sector	• Assessment of resources needed to support operators through certification process. • Commercial Information s risk profile assessment process for enabling limited BVLOS operations Commercial Information • Input into MOT review of regulatory regime.
Facilitate testing and trialing activities	• Support existing technology trials • Investigate current and potential future needs for dedicated testing sites • Explore the establishment of city based demonstration pilots
Support our existing industry, stimulate start-up activities and attract experienced innovators and investors	• Use existing levers to support companies to undertake R&D and internationalise • Develop a targeted engagement plan to connect domestic industry and investors with international innovators and investors • Develop a programme of innovation challenges
Facilitate the development of domestic R&D capabilities and talent	• Facilitate the establishment of partnerships between our research organisation and international companies and research organisations • Engage with industry and tertiary providers to support practical talent development initiatives



Annex Two: Indicative Timeline

*This is subject to change following further consultation

Annex Two: Indicative Timeline

*This timeline is indicative only, and subject to change following further consultation