



BRIEFING

Establishing a programme of airspace integration trials: next steps

Date:	31 May 2019	Priority:	High
Security classification:	In Confidence	Tracking number:	3196 18-19

Action sought		
	Action sought	Deadline
Hon Dr Megan Woods Minister of Research, Science and Innovation	<p>Agree to the proposed portfolio make-up of the programme and the phased approach to the initiation, development and delivery of the trials</p> <p>Forward this briefing to Hon Phil Twyford, Minister of Transport.</p>	10 June 2019

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	
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The following departments/agencies have been consulted
Ministry of Transport, Civil Aviation Authority, New Zealand Trade and Enterprise, Callaghan Innovation

Minister's office to complete:

- | | |
|---|--|
| <input type="checkbox"/> Approved | <input type="checkbox"/> Declined |
| <input type="checkbox"/> Noted | <input type="checkbox"/> Needs change |
| <input type="checkbox"/> Seen | <input type="checkbox"/> Overtaken by Events |
| <input type="checkbox"/> See Minister's Notes | <input type="checkbox"/> Withdrawn |

Comments



BRIEFING

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Purpose

To seek agreement to the proposed portfolio make-up of the programme and the phased approach to the initiation, development and delivery of the trials. An overview is provided in Annex One.

Executive Summary

In December 2018, you agreed to establish a programme of airspace integration trials to enable the safe testing, development and market validation of advanced Unmanned Aircraft (UA).

The objective is to position New Zealand as the location of choice for research and development (R&D) and to accelerate the integration of advanced UA into the aviation system.

Our risk-based regulatory regime and flexible approach to certification has enabled Zephyr Airworks (Zephyr) to test its Cora prototype in Tekapo and positioned New Zealand as a world leader. However, a number of countries are now positioning themselves to attract advanced UA and adjacent technology developers.

This programme will provide the mechanism for the government to partner with industry leaders wanting to develop, test and bring to market new and unproven advanced UA. The proposed portfolio make-up of the trials supports industry R&D in a range of advanced UA applications: passenger transport, cargo delivery, agricultural services, and hazard management and monitoring services.

The proposed phased approach will streamline progression from testing to in-service operations. The centralised programme management structure will coordinate industry partners, central government agencies and key local stakeholders. In December, you agreed that we discuss with Zephyr the possibility of a passenger transportation-focused trial. We are engaging with them on assessing the feasibility of Commercial Information, Information received in confidence and are aiming for a scope of the trial to be defined by August 2019.

Should you agree, we will engage other prospective industry partners to explore the feasibility and scope of agriculture and cargo transport-focused trials, and work with relevant agencies to define potential areas of interest for a trial focussing on hazard management and monitoring.

MBIE will resource the programme management however, the investment sought to develop technical capability at the Civil Aviation Authority [3153 18-19 refers] will be critical to establish these trials.

To ensure broader buy-in and further promote New Zealand as a location for R&D, we will engage industry and local stakeholders and develop a launch campaign for this programme.

Recommended action

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

- a. **Agree** to the proposed portfolio make-up of trials in the programme: passenger transport, cargo delivery, agricultural services, and hazard management and monitoring services;

Agree / Disagree

- b. **Agree** to the proposed phased approach to the development and delivery of each trial: initiation, development and delivery; and,

Agree / Disagree

- c. **Forward** this briefing to Hon Phil Twyford, Minister of Transport.

Agree / Disagree

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

Hon Dr Megan Woods
**Minister of Research, Science
and Innovation**

31 / 05 / 2019

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Background

1. In December 2018, you agreed to the establishment of a programme of airspace integration trials to enable the safe development, testing and market validation of advanced Unmanned Aircraft (UA) within our existing regulatory framework (the programme) [2052 18-19 refers]. You forwarded the advice to Hon Phil Twyford, Minister of Transport, who indicated his support to progress with the work to establish the programme.
2. This programme is a key action under the Ministry of Business, Innovation and Employment (MBIE) Innovative Partnerships' *Advanced Aviation Technologies* platform-play, which seeks to position New Zealand as location of choice for the emerging advanced UA sector [0346 18-19, refers].
3. The programme will complement and inform the broader Ministry of Transport (MOT) led vision for a thriving, innovative and safe aviation sector. MOT's UA integration work is scheduled to be discussed by Cabinet in June. A draft of the Cabinet paper "Taking flight: an aviation system for the automated age" has been forwarded to you by Hon Phil Twyford [3758 18-19, forthcoming].
4. In our December advice, we set out the high-level rationale for the programme. This paper elaborates on the objective of the programme, seeks agreement to the portfolio make-up and phased approach to the initiation, development and delivery of the trials in the programme, and outlines next steps. An overview is provided in Annex One. We recommend you forward this paper to Hon Phil Twyford for his information.

The programme will accelerate the integration of advanced UA and position New Zealand as a location of choice for R&D

Industry investment in R&D is critical to the integration of advanced UA

5. As previously discussed, the integration of advanced UA (capable of carrying passengers and performing complex tasks) into national airspace has the potential to generate significant benefits. A recent economic benefit study commissioned by MOT and MBIE (the Drone Benefit Study) estimates that the commercial application of UA could generate up to \$7.9 billion¹ in additional value to the New Zealand economy over the next 25 years.
6. The integration of advanced UA depends on industry investing in the development, testing and certification of new and unproven advanced UA and adjacent technologies (such as Ground Control Stations (GCS), Unmanned Aerial Systems Traffic Management (UTM) systems, detect and avoid technologies (DAA), batteries and noise control).

The programme provides the mechanism to partner with industry to establish a series of airspace integration trials that cover all factors needed for UA integration

7. The main factor that companies developing advanced UA and adjacent technologies consider when deciding where to locate their activities and investments is the ability to work with government to define a clear, robust and safe pathway to progress from testing to in-service operations - in particular beyond visual line of sight (BVLOS) operations.
8. Our risk-based and flexible approach to certification has enabled the development and testing of advanced UA, such as Zephyr Airworks' (Zephyr) Cora prototype, and positioned New Zealand as a leader within the international context.

¹ The Drone Benefit Study found that the value of the economic benefit to New Zealand of the commercial application of drones over a period of 25 years is between \$1.2 and \$4.9 billion. The estimate is based on baseline assumptions regarding the uptake of drones. Under an optimistic estimate of the uptake rates, the estimated value rises to between \$4.6 and \$7.9 billion. The Study looked at a number of different sectors including, horticulture, electricity, forestry and freight delivery.

9. However, the certification process focuses only on the technical and safety requirements for the specific design and operational contexts of one UA developer and operator. Alone, it does not provide a clear pathway to progress from testing to in-service operations.
10. As previously discussed, a number of countries are developing regulations that match or exceed our own, and making significant investment in initiatives to attract investment in R&D and support industry to develop and test advanced UA and adjacent technologies. An overview is provided in Annex Two.
11. The programme provides the mechanisms to partner with industry on the establishment of a series of airspace integration trails that cover all factors needed to progress from testing to in-service operations (eg identification and securing of locations for testing and in-service operations, support systems and infrastructure).
12. The proposed portfolio make-up and phased approach to the development and delivery of the trials, and the centralised programme management structure will:
 - further position New Zealand as a location of choice for R&D in the development, testing and certification of new and unproven advanced UA and adjacent technologies
 - realise the full potential for innovation of the current certification process
 - generate evidence to inform medium-to-long-term policy decisions on advanced UA integration
 - increase awareness of the potential economic and social benefits arising from advanced UA applications and their integration.

The proposed portfolio make-up supports industry R&D in a range of advanced UA applications

In December you agreed to take a proactive portfolio approach to select the trials in the programme

13. In December you agreed that the programme consist of a portfolio of trials covering a range of advanced UA use-categories and operating environments, and different levels of complexity. This will enable us to be proactive in selecting UA applications, prospective international and domestic industry partners, and locations for the trials [2052 18-19 refers].
14. Elaborating on the advice we provided in December, we have used the following criteria to define the proposed portfolio make-up:
 - the UA application aligns with New Zealand's public and private sector needs, and
 - there are a number of prospective international and domestic industry partners that are already investing in R&D in New Zealand, or have indicated an interest to do so.

We propose to focus the trials on agriculture, hazard management and monitoring, and passenger and cargo transportation related applications

A focus on agricultural services related applications aligns with the Government's focus on sustainable agriculture, and there are two prospective industry partners already in New Zealand

15. New Zealand already possesses significant expertise in the area of plant and food science, and this Government is committed to reducing the environmental impact of agriculture.
16. The use of advanced UA for commercial agricultural services could stimulate innovation and generate significant environmental and productivity gains. The Drone Benefit Study found soil and field analysis, crop monitoring, water management and crop spraying to be potential

applications for UA in the agriculture sector with the potential to deliver up to \$5 billion in benefits over a period of 25 years.²

17 Confidentiality of advice to Government, Commercial Information, Ongoing negotiations

A focus on hazard management and monitoring applications in remote areas would inform ways that UA can improve efficiency and safety across a number of private and public sectors

18. The use of advanced UA can also make it safer and more efficient to access dangerous or remote sites to monitor and manage hazards. For example, UA could be deployed to carry out monitoring of infrastructure (such as roads or power lines) in both business-as-usual scenarios and in emergency situations (such as the response to natural disasters).

19. We have not yet clearly identified the specific applications or prospective industry partners.
Confidentiality of advice to Government, Commercial Information

20. Given the public benefits, we propose to engage with key relevant agencies (eg Department of Conservation, Ministry for Primary Industries, Ministry for the Environment, New Zealand Transport Agency) to identify the potential areas of interest

Cargo and passenger transport applications are a key focus area internationally, and trials in this area would build on New Zealand's unique competitive advantage

21. The transport of passengers and cargo within suburban and urban areas is a rapidly-growing area of interest within the emerging global UA sector, attracting significant investment in R&D. While in practice, the testing and development of these technologies is likely to start in rural and suburban areas, industry's goal is to establish in-service operations in dense urban areas. Urban cargo and passenger transport applications are also the main focus of a number of international initiatives (Annex Two refers).

22. We already have a globally-leading passenger transport developer in New Zealand: Zephyr. You previously agreed that we discuss with Zephyr to establish the first trial of the programme. We are engaging with them on assessing the feasibility of Commercial Information, Information received in confidence and are aiming for a scope of the trial to be defined by August.

23. Alongside a passenger transport trial in partnership with Zephyr, we propose to further explore the possibility of a cargo transport trial.

Commercial Information, Information received in confidence, Ongoing negotiations

We propose to continue these engagements to further define the feasibility and the scope of potential trials.

To further inform the establishment of the trials we are conducting work on test sites and real-world test locations for in-service operations

24. While some prospective industry partners have indicated their preferences for locations to test and market validate their technologies, we need to undertake further work on test sites and real-world test locations.

² The Drone Benefit Study found that the potential economic benefit to New Zealand of commercial applications of drones in the primary industries to be between \$3.2 and \$5.0 billion over a period of 25 years. The estimate is based on optimistic assumptions regarding the uptake of drones, including in the dairy sector, and relies on the realisation of technological advances that will allow operations beyond the visual line of sight.

25. Our current assumption is that all participants within the programme would need to have access to test sites to trial their developing technologies. Test sites would also contribute to broader UA industry development and the long-term goal of UA integration.
26. There are a number of private stakeholders that have approached government (MBIE, New Zealand Trade and Enterprise (NZTE) and MOT) for support in establishing test sites at various locations in both the North and South Islands. These test sites could be used by industry partners as part of the programme, as well as by the broader UA industry. However, further work is needed to assess national and industry requirements for test sites, and whether the government should support the current presenting opportunities.
27. In addition to test sites, real-world test locations will be needed by industry partners to market validate their technologies in conditions similar to the environment in which they intend to carry out their in-service operations. Real-world test locations will be required once the technology and operations have undergone the necessary certification and safety testing at test sites and are nearly ready to go to market.
28. In collaboration with MOT, Civil Aviation Authority (CAA) and NZTE, we are undertaking further work on understanding both government and industry requirements for test sites and real-world test locations, and we intend to engage with the broader aviation sector as well as relevant local stakeholders throughout this process.

The proposed phased approach streamlines progression from testing to in-service operations

We propose a three-phased approach to the development and delivery of each trial

29. We have worked with CAA and MOT to develop the following high-level three-phased approach to the development and delivery of each trial. Depending on the scope and delivery plan of each trial, specific timeframes will vary.

Initiation Phase: Assess the credibility of prospective industry partners, and define the feasibility and scope of the intended trial

30. During this phase, prospective industry partners will be invited to present a high level business plan and description of the intended operations to the relevant agencies. These will then be assessed based on the following high-level criteria:
- the prospective industry partner's ability to participate in the programme (eg investment sources, experience) and share their learnings through the programme
 - the economic and social benefits associated with the specific trial (eg jobs, investments)
 - the level of support needed by the prospective industry partner (eg certification support, identification of test-sites and real-time test locations)
 - the intended operation's impacts on the safety of the aviation system and other users
 - opportunities to test adjacent technologies and involve the participation of adjacent technology developers (eg UTM providers)
 - other potential partnership opportunities (international and domestic)
 - any risks and mitigations (eg public acceptance, resource impact on relevant government agencies).
31. Should the prospective industry partners meet the above criteria and the trials be considered feasible, the scope of the intended trial and roles and expectations would be defined in a Memorandum of Understanding (MOU). The MOU will outline the commitments of the relevant agencies to provide support and coordination for the trials (eg through certification support, local stakeholder engagement and test location identification), and the industry partner's commitment to carrying out the trial and sharing their learnings through the programme.

Development Phase: Work with the industry partner to develop the detailed delivery plan for the trial

32. The development of a delivery plan is iterative and comprises:

- detailed definition of the schedule for the progression from innovation and experimental testing to in-service operations
- development of a certification pathway
- definition of support system and infrastructure needed
- establishment of partnerships with adjacent technology providers, as appropriate
- ongoing engagement with key local stakeholders
- any other activities as identified in the MOU – eg potential opportunities to partner and connect with other jurisdictions.

33. The final delivery plan will need to be agreed between the industry partner, relevant government agencies, and other key stakeholders.

Delivery Phase: Work with the industry partner to execute the trial

34. This will include:

- technology development and testing
- necessary certification or regulatory approvals
- airspace management
- ongoing engagement with local stakeholders
- sharing the findings of trials and economic development opportunities between participants and with relevant agencies.

We propose to undertake further work on the scope of each of the phases

35. To create a clear, safe and robust pathway from testing to in-service operations, in collaboration with CAA and MOT we propose to work with prospective industry partners to further define the proposed phased approach. This will also help to identify resource requirements and detailed planning for the programme.

The centralised programme structure will coordinate industry partners, central government agencies and key local stakeholders

36. As previously discussed, no financial incentives will be provided through the programme. The value of the programme is in the proactive and coordinated multi-agency approach. A programme manager will sit across all three phases for each trial to coordinate input and actions of industry partners, relevant agencies and other key local stakeholders.

37. MBIE will provide the overall programme management, while stakeholder agencies and organisations remain accountable to their respective minister, executive or board. As the overall programme manager, MBIE will regularly engage with the MOT-led UA Leadership Group that oversees the Government's broader work on UA integration to maintain ongoing support for specific trials, and discuss any opportunities and challenges as they arise.

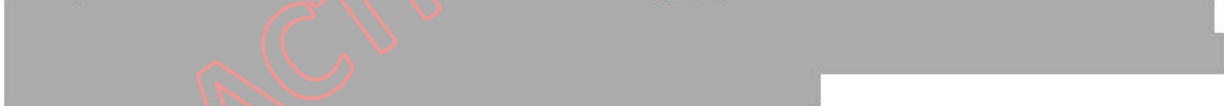
38. It is important to note that CAA, as the aviation regulator, will contribute to the planning and conduct of the programme where appropriate, without losing the ability to make independent regulatory decisions. There is an existing and complex aviation system with multiple airspace users and any activity cannot introduce new risk without appropriate mitigation measures that satisfy the Director of Civil Aviation. No guarantees will be made to participants that their operations will be certified, and CAA will retain the right to decline approval for trials that it does not consider to be safe at any stage in the process. Mechanisms will be required to preserve the independence of regulatory decision makers while also enabling regulatory engagement with CAA's subject matter experts for guidance on operations, airworthiness and airspace use.

Risks and mitigations

Participation of UA industry leaders will support the success of the programme

39. The new and unproven nature of the technologies needed for UA integration creates some uncertainty for the programme, as expected technology developments may not be realised and as a result the industry partner may fail to satisfy the relevant certification requirements.
40. The proactive approach to the identification of industry partners will mitigate this risk by ensuring that we target UA industry leaders that have the aviation experience, technical expertise and funding needed to succeed in the programme.

Proactive selection of industry partners does not disadvantage the broader UA industry

41. MOT is concerned that the proactive approach to the selection of industry partners could create the perception that the Government is favouring specific companies, and that this could be mitigated by undertaking a request for proposals (RFP) process. While we acknowledge that proactive selection could be seen as unduly favouring selected industry partners, we do not consider that an RFP process would be appropriate.
42. The focus of the programme is on attracting industry investment in R&D that will accelerate the integration of advanced UA. The programme encourages partnership with adjacent technology providers, and does not preclude other industry players to approach the CAA to gain certification, or Innovative Partnerships for support.
43. An RFP process would be appropriate if the programme provided funding. However, the programme does not provide financial incentives, and the trials do not predetermine long-term decisions around industry participants' operations and airspace allocation. Furthermore, a full RFP process would be resource intensive and lengthy. Confidentiality of advice to Government

44. The perception that the programme unduly favours selected industry partners can be mitigated by clearly articulating the objective of the programme, the rationale for the selection criteria set out in the *Initiation Phase*, and opportunities for partnership and broader industry involvement.

Proactive engagement will promote acceptance

45. Accelerating the integration of advanced UA may raise safety or privacy concerns among the public or the wider aviation industry, particularly in the General Aviation community. There may also be a risk that the programme be perceived by other airspace users or the public as favouring the UA industry.
46. To manage concerns and promote acceptance, we propose to develop a launch campaign with corresponding engagement plan. The further work we propose to do on test sites and real-world test locations will also involve engagement with the wider aviation industry and key local stakeholders to understand and alleviate potential concerns around access to airspace.

Ongoing commitment to the programme is critical to success

47. As mentioned above, depending on the scope and technical complexities of each trial, specific timelines will vary. Our preliminary assessment is that the programme will run until at least 2022/2023. A review of the programme at this point will inform any next steps to support progress towards in-service operations and to provide sufficient evidence to inform the long-term MOT-led integration work.

48. MBIE is able to resource the programme management for the establishment and implementation of the trials. However, investment sought to grow and develop technical capability at the CAA will be critical to the success of the programme and ensure New Zealand maintains its reputation as an internationally credible and innovative regulator. MBIE will be providing you with separate advice on this [3153 18-19 refers].

Next steps

49. If you agree to the proposed portfolio configuration and phased approach to the establishment of the trials we will work with key government agencies to:

- engage with prospective industry partners on the establishment of trials, with a focus of entering into an MOU with Zephyr in August
- undertake work on suitable test sites and in-service locations, and engage with local stakeholders
- undertake further work on the scope of each of the phases
- prepare a launch campaign for the programme, intended for August.

Annexes

Annex One: Overview A3 - Establishing a programme of airspace integration trials

Annex Two: Examples of international initiatives

Innovative Partnerships: Establishing a programme of airspace integration trials: next steps

The programme's objective is to accelerate the integration of advanced UA and position New Zealand as a location of choice for R&D.

Industry investment in R&D is critical to the integration of advanced UA

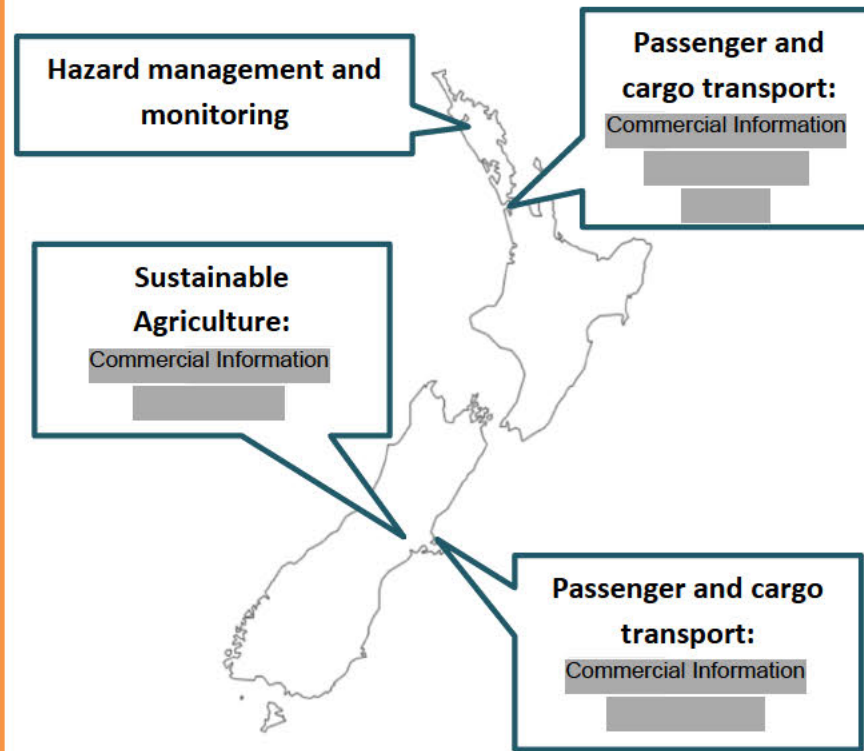
The integration of advanced UA into national airspace has the potential to generate significant benefits and is the focus of broader inter-agency work led by the Ministry of Transport.

The integration of advanced UA will require industry investment in the development, testing and certification of new and advanced technologies.

The main factor companies consider when deciding where to locate their R&D activities and investments is the ability to work with government to define a clear, robust and safe pathway to progress from testing to in-service operations.

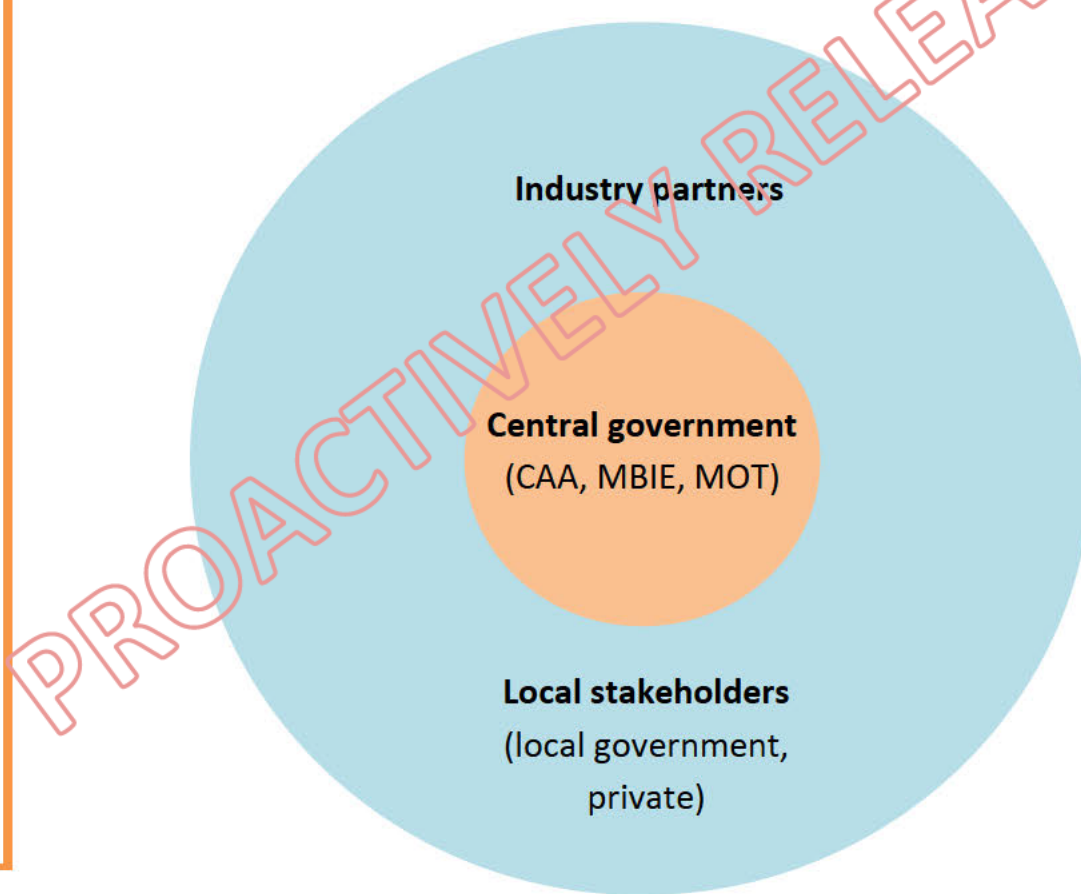
The programme provides the mechanism to partner with industry to establish a programme of trials that cover all factors needed for UA integration.

The proposed portfolio make-up supports industry R&D in a range of advanced UA applications

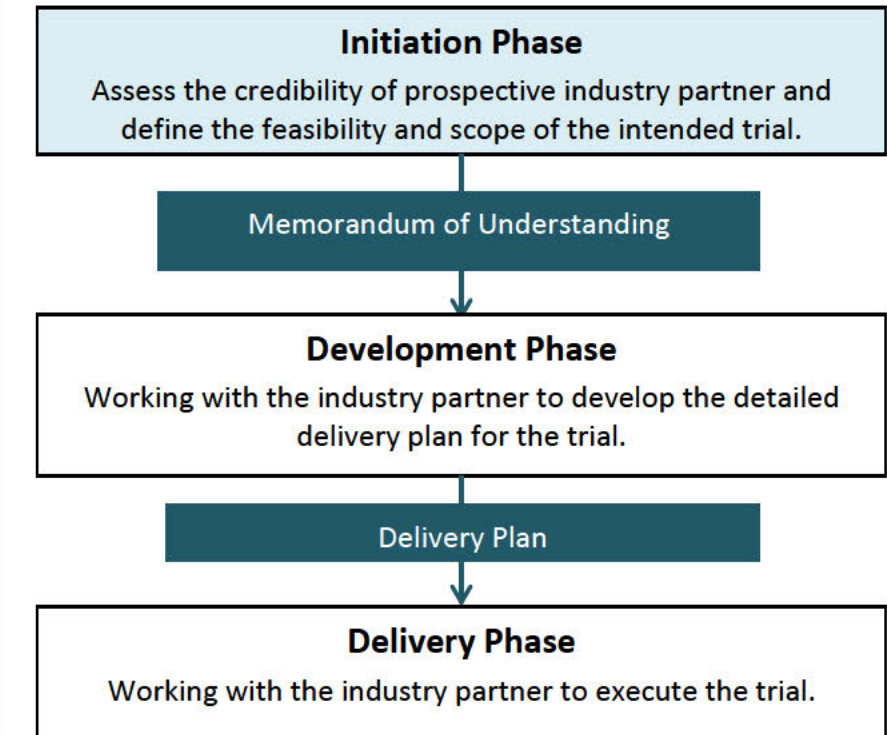


This figure is indicative only – further engagement with prospective industry partners and work on test sites and real-world test locations is needed.

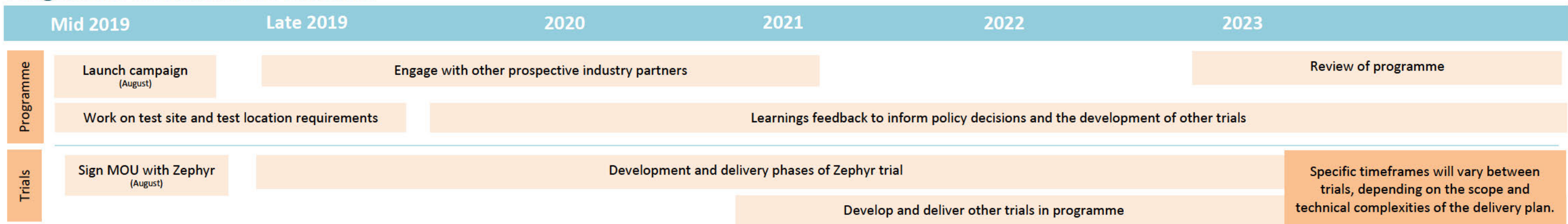
The centralised programme structure will coordinate industry partners, central government agencies and key local stakeholders



The proposed three-phased approach streamlines progression from testing to in-service operations



Programme Establishment Timeline:



Annex Two: Examples of international initiatives

Location	Description of initiative
Europe	<ul style="list-style-type: none"> The European Network of U-space Demonstrators is enabling initial BVLOS testing in rural, urban and sub-urban environments. For example, the Swiss U-space demonstration has allowed routine BVLOS operations to transport time-sensitive medical laboratory samples and urgently-needed medication between two hospitals in the city of Berne. The European Innovation Partnership: Smart Cities and Communities – Urban Air Mobility Initiative (EPI-SCC-UAM) was developed to bring together cities, industries, investors and researchers to promote development and commercialisation of UAM applications. The Initiative is led by Airbus and involves twelve front-runner cities who will be executing demonstration projects throughout 2019. The lessons learnt from these projects will inform recommendations for a UAM deployment strategy and roadmap.
Singapore	<ul style="list-style-type: none"> In 2016, Airbus Helicopters signed an agreement with the Civil Aviation Authority of Singapore to develop the technical requirements to safely operate parcel delivery services by UA in urban environments (the Skyways programme). Since early 2018, routine parcel delivery demonstrations have been carried out on the campus of the National University of Singapore. In March 2019, the Skyways programme was extended to include shore-to-ship trials in real port conditions, using UA to deliver parcels to anchored vessels up to three kilometres from the coast.
United States	<ul style="list-style-type: none"> Seven UA test sites have been in operation since 2013 to enable advanced UA research and validation of operations. Data from the test sites is used by the Federal Aviation Authority (FAA) to determine technical and operational trends and to inform regulatory decisions. The Integration Pilot Program involving nine lead participants, partners state, local and tribal governments with private stakeholders. The trials are focused on a range of operations including night flights, flights over people, BVLOS, package delivery, DAA technologies and the reliability of security links between UA and remote pilots. The three-year programme will contribute to applications in a range of sectors including commerce, emergency management, photography, agricultural support and infrastructure inspections.
United Kingdom	<ul style="list-style-type: none"> The Innovation Sandbox programme allows companies to develop, trial and test emerging advanced aviation technologies and bring these services to market. Six initial participants with projects including passenger and cargo transport, BVLOS flights and UTM services. Participants will receive guidance from the UK CAA to meet their regulatory requirements.