Concept of Operations 2023

version 2.0

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Cover Image

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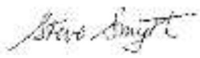
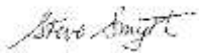
List of Acronyms

Acronym	Term
ACE	Airport Capacity Enhancement
A-CDM	Airport Collaborative Decision Making
ADS-B	Automatic Dependent Surveillance - Broadcast
ADS-C	Automatic Dependent Surveillance - Contract
AFTN	Aeronautical Fixed Telecommunication Network
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Services
AIXM	Aeronautical Information Exchange Model
AMAN	Arrivals Manager
AMHS	ATS Message Handling System
ANSP	Air Navigation Service Provider
APCH	Approach
ATC	Air Traffic Control – a sub-function of Air Traffic Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Service – a sub-function of Air Traffic Management
Baro VNAV	Barometrical Vertical Navigation
BeiDou	China Global Navigation Satellite System, not yet fully operational
CAA	NZ Civil Aviation Authority.
CA	Controlled Airspace
CCO	Continuous Climb Operations
CDM	Collaborative Decision Making
CDO	Continuous Descent Operations
CONOPS	Concept of Operations
CPDC	Controller Pilot Digital Communication
CPDLC	Controller Pilot Data Link Communications
DME	Distance Measuring Equipment
FAA	Federal Aviation Administration
FIR	Flight Information Region
FL	Flight Level

Acronym	Term
FTO	Flight Training Organisation
GA	General Aviation
Galileo	European Global Navigation Satellite System, not yet operational
GBNA	Ground Based Navigation Aid
GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema. Russian Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Service
HF	High Frequency
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IRU	Inertial Reference Unit
ITS	Intelligent Transport System
IWXXM	ICAO Weather Exchange Model
LPV	Localizer Performance with Vertical Guidance
MET	Meteorological
MON	Minimum Operational Network
MoT	Ministry of Transport
MSAS	Multi-Functional Transport Satellite Augmentation System, MSAS-MTSAT, Japan
NAANP	National Airspace and Air Navigation Plan
NAVAIDS	Navigation Aids
NM	Nautical Mile
NSS	New Southern Sky programme
PB	Performance Based
PBCS	Performance Based Communications and Surveillance
PBN	Performance Based Navigation
PBN Manual	Performance Based Navigation Manual, ICAO Doc 9613 4th Edition
PinS	Point in Space
RAIM	Receiver Autonomous Integrity Monitoring
RCP	Required Communication Performance
RLP	Required Link Performance

Acronym	Term
RPT	Regular Passenger Transport
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP-AR	Required Navigation Performance – Authorisation Required
RSP	Required Surveillance Performance
RWY	Runway
SATCOM	Satellite Communication
SATVOICE	Satellite Voice Communication
SARPs	ICAO Standards and Recommended Practices
SBAS	Satellite Based Augmentation System
SID	Standard Instrument Departure
SOA	Service Oriented Architecture
SSR	Secondary Surveillance Radar
STAR	Standard Terminal Arrival Route
SUA	Special Use Airspace
SWIM	System Wide Information Management
TCAS	Traffic Collision Avoidance System [Traffic Alert and Collision Avoidance System]
Unmanned Aircraft	Previously Remotely Piloted Aircraft System (RPAS)
UTM	Unmanned Traffic Management [Unmanned Aircraft System Traffic Management]
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VoIP	Voice Over Internet Protocol
VOR	VHF Omnidirectional Range. Ground based navigation aid

CONOPS Review

Revision	Date	Authorised By	
		Name	Signature
Issue 1	6 July 2016	Steve Smyth	
Issue 2	17 October 2018	Steve Smyth	
Issue 3			
Issue 4			
Issue 5			

The intention is for this CONOPS document to be reviewed and updated, as needed, to keep pace with the changes to the New Zealand aviation system being introduced through NSS.

This is a living document and this is version two. It is intended that it will be updated continually as further work matures and can be incorporated. This version of the CONOPS reflects the Global Navigation Satellite System (GNSS) work, the Ground Based Navigation Aid (GBNA) Infrastructure Strategy paper, PBN Implementation Plan Revised 2017 New Zealand Version 2.1.

New Southern Sky

Concept of Operations

Executive Summary

1. This document, the Concept of Operations (CONOPS) is a description of how a set of capabilities may be employed to operate in New Zealand's domestic airspace in 2023. The CONOPS is aligned with the National Airspace and Air Navigation Plan[1] (NAANP). The CONOPS is a collaborative document, produced with input from the stakeholders that have taken guidance from the NAANP, Global Navigation Satellite System Sole Means Report, Ground Based Navigation Aid Minimum Operating Network, and used it to provide a reference framework for the New Southern Sky (NSS) programme end state. The CONOPS models today's view of the airspace in the New Zealand Flight Information Region (FIR) aviation system 2023. Aviation industry input enables a segmented view, by operations type, of this system.

2. A wide spectrum of New Zealand's aviation industry operates throughout the FIR airspace. At one end of the spectrum are international flights entering or departing the FIR, there are domestic jet operations in airspace above FL245, medium level Regular Passenger Transport (RPT) operations between FL130 to FL245 and lower level operations through to FL130. Military and Corporate aircraft operate throughout this airspace range. General Aviation (GA) and helicopters operate mainly in the airspace below FL130.

3. The scenarios provide a detailed stakeholder view of how these airspace layers will be flown by operators and the capabilities they will employ for optimum efficiency and safety.

4. By 2023, the New Zealand FIR will see greater use of digital data, providing a rich environment for information dissemination to aviation systems users. Optimal use of airspace will be achieved through suitably equipped aircraft operating in this airspace. This technology transition will be flexible, enabling growth in aircraft movements through the FIR and be able to accommodate aircraft with different capabilities.

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[1] New Southern Sky, National Airspace and Air Navigation Plan, June 2014

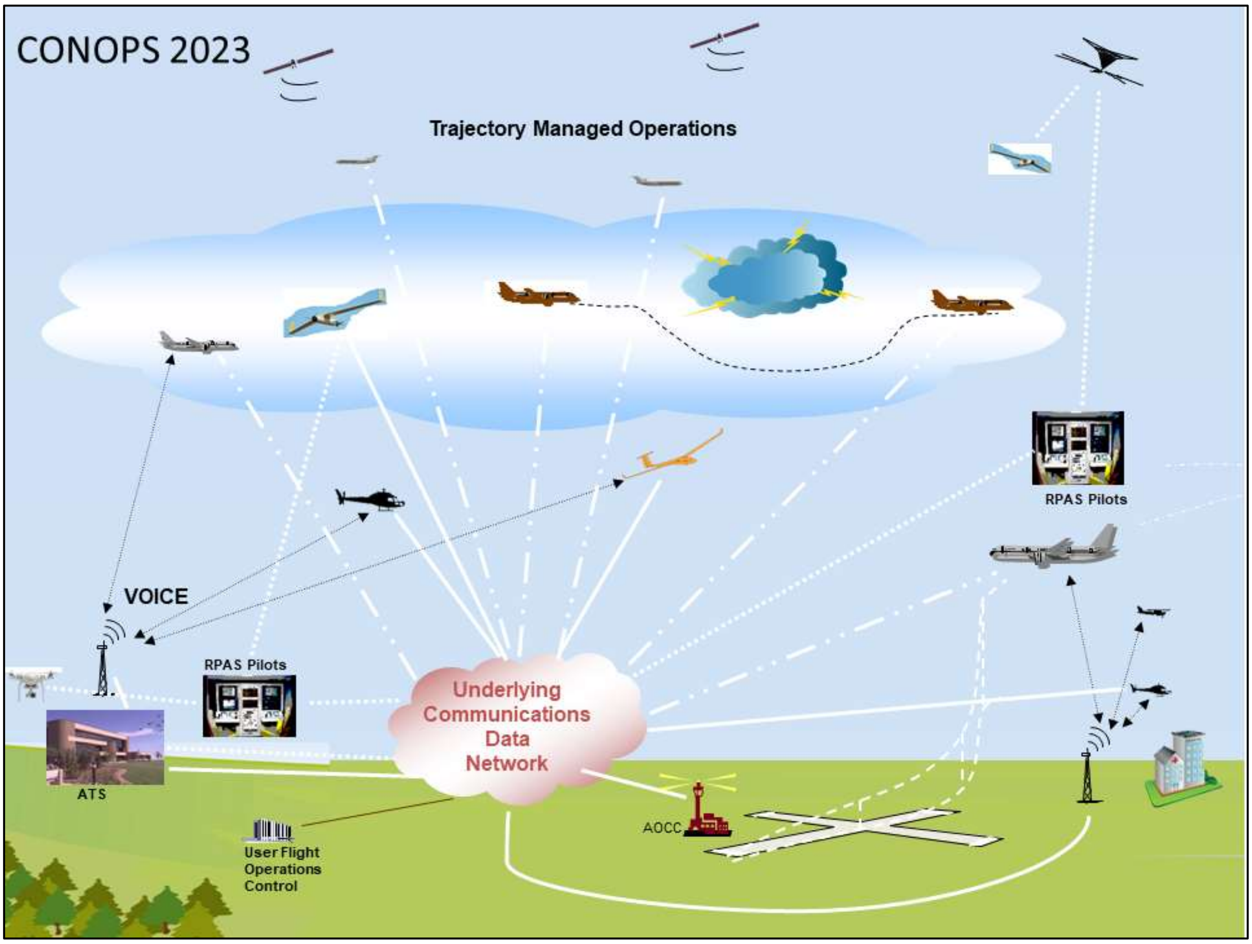
5. The design will be unique to New Zealand, providing operationally ready airspace.

6. This CONOPS articulates what the NSS Programme will deliver to the New Zealand aviation system. Ultimately it will be enabled through appropriate policy, regulations, where needed, and users deploying the appropriate equipment. The CONOPS adds to the NSS strategy and objective outcomes work programme. It should be noted where proposed change refers to policy decisions yet to be made, the content herein should be taken as a vision of the future, rather than a statement of what will happen.

7. Aviation Infrastructure is integral to the New Zealand transport system and economy. The transition to a Performance Based Navigation (PBN) environment will be integral to the 'Intelligent Transport System' strategy of the Ministry of Transport and in addition, the introduction of PBN enabled airspace nationally enhances the safer journeys concept.

8. As policy, regulations, collaborations, and technology develop, the concept will be continually reviewed to keep pace with these changes.

Figure 1: CONOPS 2023



Introduction

9. This CONOPS document is a description of how a set of capabilities may be employed to operate in New Zealand's domestic airspace in 2023. The CONOPS is aligned with the NAANP, PBN Implementation Plan (Revised 2017), Global Navigation Satellite System (GNSS) Sole Means 'conditions' work and the New Zealand Ground Based Navigation Aid (GBNA) Infrastructure Strategy.

A Concept of Operations is a document describing the characteristics of a proposed system from the viewpoint of an individual who will use that system. It is used to communicate the quantitative and qualitative system characteristics to all stakeholders.

10. The CONOPS is a collaborative document, produced with input from the stakeholders and is used to provide a reference framework for the NSS programme end state.

11. There have been significant advances in technology that allow information derived from digital and satellite data to be integrated into aviation system wide activity to provide significant increases in safety, efficiency, and reliability.

The aim of the CONOPS is:

- To provide an agreed stakeholder view of the New Zealand aviation system and how it will operate in 2023.

The objectives of the CONOPS are:

- To articulate the NSS 'target concept' in terms of a system.
- To incorporate NSS System Safety Criteria as the foundation of a safe system approach.
- To incorporate agreed assumptions as the foundation of a recognised system approach.
- To provide an understanding of how stakeholders expect to conduct safe and effective operations within the environment prescribed by the PBN Implementation Plan (Revised 2017), GNSS Sole Means 'conditions' work, and the New Zealand GBNA Infrastructure Strategy.
- To provide stakeholder business planning alignment and coordinated decision making at all levels.
- To step beyond the component proposals of the NAANP and provide an agreed stakeholder view of the 2023 'system end state'.
- Identify areas/functions of the aviation system requiring further development, especially as incremental changes towards 2023 identify new areas in need of review.

We are changing the way we operate so that the aviation industry can achieve economic growth through efficiency gains

12. Change is being driven via a global model developed at ICAO, this will be refined and modelled for the local region to meet international safety standards and best practices, this will also contribute to economic growth through efficiency gains'[2]. Benefits increase as more industry stakeholders make strategic choices to engage in the process of change, to implement new technologies or to refine procedures.

13. We therefore need to contextualise and explain how that looks from a system perspective.

Without compromising safety, we aim for efficient, environmentally responsible, integrated and interoperable systems

14. These attributes will be enabled, if not solely delivered, by the ability to dynamically manage aircraft through:

    a. Integrated communications data to information networks.
    b. Integrated scheduling and flight planning.
    c. Enhanced surface operations.
    d. Streamlined departure management.
    e. Efficient cruise.
    f. Streamlined arrival management.
    g. Airport surface capacity enhancement.

15. There is a cohesive relationship between all elements of the attributes sought and the delivery mechanisms. To ensure reasonable ongoing support for the GA community, ongoing service will be provided to operators with compliant equipage.

Trajectory management is key to safety and efficiency

16. New trajectory management tools will enable controllers to safely manage potential conflicts and provide increased efficiencies across the network to the benefit of all users of the airspace.

17. The trajectory management of aircraft will enable the new operating environment to manage an aircraft's profile from departure gate to arrival gate, including both civil and military operations. This environment will be achieved through greater strategic integration and coordination of ATM to enable efficient aircraft operations.

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[2] New Zealand's National Airspace Policy seeks 'a safe and capable airspace and air navigation system both within New Zealand and the international airspace it manages, that aligns to international safety standards and best practices, and contributes to economic growth through efficiency gains'

18. The implementation of NSS enables optimisation of capacity in New Zealand airspace.[3]

Assumptions

19. A number of assumptions have been applied to both the development of safety criteria and this CONOPS. Key assumptions are:

   a. The current aviation system is safe.
   b. A GBNA network will be in place to support Recovery and Contingency operations and will be known as the Minimum Operational Network (MON).
   c. The MON will be able to support all operational IFR requirements within the NZFIR, which needs to be enabled by appropriate safety analysis and rule development.
   d. It continues to be the operator's responsibility to assess their operations against PBN requirements, including the safe recovery of aircraft in the event of the loss of navigation capability.
   e. An aircraft with an approved RNAV capability based on GBNA (DME/DME and DME/DME/IRU) may be able to continue operations or recover using PBN RNAV standards in the event of the loss of GPS navigation capability.
   f. A non-cooperative surveillance system is expected to be operating at Auckland, Wellington and Christchurch and possibly other locations on a case-by-case basis.
   g. The CONOPs assumes systems capacity will accommodate increases in IFR traffic demand.
   h. Procedures will be in place to allow increasing numbers of Unmanned Aircraft (UA) to operate safely in the NZ FIR; however, their operation under IFR was out of scope[4] of the GBNA review. It is acknowledged later within the CONOPS that UA will need to operate under IFR in the future.
   i. The aerodrome network for RPT aircraft will be similar to today.
   j. There will be increased pressure on the aviation system from environmental factors.
   k. Airport Collaborative Decision Making (A-CDM) will be used by the majority of New Zealand International airports.
   l. Remote ATS is expected to be operating before 2023.
   m. Supporting regulatory development (performance based, future proofed) will be needed to ensure it supports and maintains pace with technology development, thereby avoiding the potential for increased safety risks.

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[3] The background to NSS can be found at https://www.nss.govt.nz

[4] Unmanned aircraft operation IFR was out of the scope of the GBNA Strategy V1.0.

n. It is assumed that along with regulatory change, other interventions such as training, education, information, guidance, sector-led initiatives, market forces, etc. will also be needed to support realisation of this future vision.

Constraints and Limitations

20. The CONOPs is subject to the followed constraints and limitations:

a. The civil aviation regulatory framework will continue to contain a mix of policy and performance and risk based rules to support this CONOPS.
b. The ICAO Standards and Recommended Practices (SARPs) are the basis for the aviation system.
c. The CONOPs are designed to meet the aviation system safety criteria (ASSC); the ASSC was devised to provide criteria to guide system collaborators ahead of the development and delivery of the relevant rules.
d. The CONOPs describe an end state for NSS, with transition being out of scope.
e. All the elements of the aviation system outlined in the NAANP have been considered.
f. The Navigation element of the CONOPs is PBN, based on GNSS, for IFR operations in all New Zealand airspace.
g. The Surveillance element of the CONOPs assumes that ADS-B will be used in all controlled airspace from 2021.
h. The Communications element of the CONOPs assumes that VHF will remain the primary means of communication within the New Zealand FIR.
i. The CONOPs covers gate to gate and non-scheduled operations of all IFR aircraft and helicopters, including flight planning and ground movements.
j. The CONOPs also includes VFR operations where they interact with controlled airspace, including UA.
k. Flight training operations will continue to access the New Zealand aviation system.
l. The MON recommendations made to Airways in Stage 2 need to be tested against appropriate rule development and revisited as required given the wider implications identified in support of routine IFR operations under PBN.

GNSS/PBN Conditions

21. The CONOPS is based on the PBN Implementation Plan Revised 2017 New Zealand Version 2.1.

22. Optimisation of airspace and aviation systems management is delivered through the concept of 'best equipped best served'. However, an adequately equipped aircraft will be assured service. Operators equipped to meet the requirements outlined in the

CONOPS will therefore likely accrue the greatest efficiencies and resulting benefits within the NSS framework.

GNSS, from Single System GPS to Multi Constellations

23. The emergence of multi constellation satellite systems, rather than the original USA GPS system is now a feature globally with the BEIDOU (China) and GLONASS (Russia) joining GPS as global systems controlled through the respective country military organisations. GALILEO is the European global satellite system and is civilian controlled. Two further regional systems are found in India, NAVIC, and Japan, QZSS.

24. All the GNSS systems are supported with augmentation systems enhancing position accuracy[5]. However, they must be certified (like GPS) for use in Aviation systems. They present a future opportunity to integrate multi-constellation GNSS receivers in the aviation domain (as is already creeping into consumer electronics). If certified, these add increasing benefit to availability and continuity (i.e. resilience of the GNSS signal through more satellite system options), but each opportunity would need to be assessed in the context of the New Zealand aviation environment.

The Changing Nature of the Industry

25. UA is a disruptive technology already revolutionising industries such as agriculture, surveying, and photography, and have applications in logistics, transport, infrastructure networks and security.

26. Importantly, UA are capital cost effective. Connecting UA capabilities and attributes with business needs will see exponential growth driven by the ongoing evolution of the UA regulatory environment, the ingenuity of manufacturers and operators, and underlying demand. While continuing to enable the thriving UA industry, NSS facilitates the safe integration of UA into New Zealand airspace.

27. A further example is Rocket Lab, which has completed projects with 4 of it's over 80 launches conducted from the Mahia Peninsula in New Zealand. Safety zones are currently activated in the hours preceding a launch. The intent is to reduce this window as launch processes become faster and launch operations become routine.

28. It is likely that helicopter operations will be integrated enabling separation from fixed-wing traffic to allow simultaneous non-interfering operations in dense terminal airspace, as well as reduced protected areas along low level routes in obstacle-rich environments to reduce exposure to icing environments. Seamless transition from en-route to terminal route is also envisaged, as well as a need for more efficient terminal routing in obstacle-rich or noise-sensitive terminal environments. This is

[5] Details can be found in the PBN Implementation Plan Revised 2017 New Zealand Version 2.1

particularly relevant to HEMS IFR operations to hospital helipads. Other operational needs leading to the development of the RNP 0.3 navigation specification include transitions to Point In Space (PinS) approaches and for departures.

29. These developments lead to enhanced safety in helicopter operations.

30. RF legs may be incorporated in other Navigation Specifications in future, thereby enabling greater efficiency for en-route and terminal operations for a wider cross section of aviation users. However, this does not include approval of RF path terminators and curved flight paths at this stage.

31. There will be new ATM procedures and new manned and UA types, but the benefits extend beyond these technologies and their control. There will be a better use of airport infrastructure and our aircraft, not only on the ground but also in the air.

32. With NSS there could be new safety tools, which are better able to predict risks and then identify and resolve hazards. These new safety tools should allow a more proactive approach to incident and accident prevention. Other options might include the use of new security tools that are able to automatically detect anomalous behaviour.

33. NSS will optimise the operational use of New Zealand airspace by improving capabilities that manage and use it. Each capability provides additional layers of operational improvement. The foundational infrastructure is either in-place or will be by 2021. That infrastructure incorporates transformational technologies that will improve operational efficiencies, including savings in time, fuel and emissions that will benefit New Zealand's economy and environment, but regulations will need to keep pace with infrastructure change to not precipitate increased safety risks.

34. The latter will be delivered in part by a significant technology shift in digital data capability and availability. Turning this digital data into information or intelligence that is operationally useful will be key to the success of the NSS optimisation programme.

Discrete Operations

35. Discrete operations by the military or police are likely to occur in both controlled and uncontrolled airspace. Procedures will be provided for discrete operations for Police and Defence operations that need to work covertly.

System Component Overview

36. The CONOPS takes a systems approach to IFR aircraft operations from 'gate to gate', including ground operations; however, the following paragraphs set out the characteristics of each of the component parts that make up that system as defined in the NAANP. They are:

The Three Stages

37. The NSS programme delivers system outcomes through three stages to achieve the end state in 2023. This CONOPS is the end state; it is achieved through a staged implementation plan.

Table 1: Programme Stages

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
New Southern Sky – *implementation plan*	Continued use of legacy navigation applications while PBN capability is progressively implemented in aircraft fleets and the supporting infrastructure. The ground infrastructure associated with legacy navigation systems will be reviewed and progressively adapted.	Move to a more exclusive PBN environment that places greater reliance on the level of PBN capability in the national fleet and infrastructure. The ATM system will be managing a more homogeneous navigation capability.	A mature PBN environment with a comprehensive fleet and infrastructure capability. Air traffic management tools complement airborne systems and enable the management of those aircraft that may experience temporary loss of PBN capability. Contingency ground infrastructure that enables all aircraft to safely return to the ground.
Status	Complete	In progress	In progress

Performance Based Navigation – Conventional to Performance Based Navigation

38. In the New Zealand FIR, PBN is based on using GPS to enable both RNAV and RNP operations. All aircraft with PBN approval based upon GPS, when operated by approved pilots, will meet RNAV and RNP specifications; aircraft with legacy GPS IFR approval are restricted to RNAV specifications (note that currently some aircraft with legacy GPS IFR approval are not able to conduct RNAV specifications – equipment limitation). Both RNAV and RNP enabled aircraft will operate directly between waypoints instead of GBNA, providing optimal flight path trajectory management, providing all the systems supporting PBN are incorporated and utilised.

39. RNP 0.3 (H) designed low level routes and procedures will be built into the system by 2023 specifically for helicopter operations.

Ensuring Concept Coherence – Keeping Pace with Change

40. Technology changes being introduced incrementally towards the 2023 end state, will be implemented in a coordinated manner. This will minimise the risk of infrastructure development outpacing supporting regulatory change. An extension of this challenge is the need to address the different needs of aviation system users, such as ensuring reasonable ongoing access for GA. This includes ongoing service for operators with compliant equipment.

41. One such example is the GBNA recommendations for the MON to support Recovery and Contingency operations. Changes to the GBNA network need to be supported by safety analysis of consequential effects, and associated rules review. Where the GBNA MON proposal cannot be supported by rules, then the MON will need to be revisited and modified as an iterative process. This situation is currently being reviewed, incorporating feedback from aviation system users regarding second order effects of the reduced network. If extant rules remain in place, the GBNA network may be required to support wider elements of the aviation system than just Recovery and Contingency operations. In particular, it will be needed to support routine IFR operations such as alternate nomination requirements to ensure ongoing access to a number of operators

42. The Security and Resilience dimensions of an aviation system are essential to delivering whole of nation benefits which may not always be front of mind when everything is running smoothly. However, in times of crisis or emergency, it is necessary for the system to have a depth and robustness beyond what might otherwise be justifiable or cost effective. With a number of recent earthquakes, slips, and floods severing arterial land transport links, the need for robust and resilient transport systems in New Zealand is clearly apparent. An aspect of this resilience must extend to aviation systems. Hence future aviation systems need the design

characteristics that, within reason, permit response to natural and man-made disasters at an acceptable level of risk.

Surveillance – Reducing our reliance on radar

43. Automatic Dependent Surveillance-Broadcast (ADS-B) technology is the primary method of air traffic control surveillance.

44. Surveillance will change; the current radar based surveillance model will not be maintained in its current form when the current radar systems reaches end of life in 2021. Transition to ADS-B ATS surveillance capability commenced in 2018 to provide for a full ADS-B capability in controlled airspace by 2021.

45. Resilience of the Surveillance system will be provided by a combination of cooperative (e.g. ADS-B, Mode-S, Secondary Surveillance Radar) and non-cooperative surveillance systems. The type and coverage of this combination will be based on a number of factors, such as density, complexity and support to contingency operations, with corresponding safety analysis.

46. The non-cooperative surveillance system will be needed to deal with three broad scenarios: Recovery during significant GNSS system degradation or failure; Contingency operations post system wide GNSS degradation/failure; and, to detect non-cooperative contacts (such as UA) which could pose a significant safety hazard in controlled airspace.

Communications – Incremental improvements

47. VHF remains the prime means of communication in the NZFIR with HF, CPDLC, and SATVOICE for Oceanic communication.

48. The VHF radio network remains a key element of this CONOPS. However, during Stage 2 data-link technology has been extended to some ground-ground departure clearance communications capabilities[6] and the technology will be reviewed in the future.

49. Uptake of CPDLC and SATVOICE communications technology will likely increase in Oceanic airspace; however, it is likely HF will continue to be supported as the primary means of communication. By the end of Stage 2 of the programme, when ICAO is expected to have finalised proposed changes, NSS will recommend to Governance if the NAANP guidance (page 36) that SATVOICE will supersede HF as the primary voice system in Oceanic airspace during Stage 3 can still be supported.

50. Voice over Internet Protocol (VoIP) will link remote sites for ground communication and aircraft applications. Exchange of messages and digital data between aviation

[6] 'CDL' for jet and 'Silent Clearances' for turbo-prop airliners.

users will use Air Traffic Service Message Handling System (AMHS) and ultimately the Aeronautical Telecommunication Network (ATN).

51. A key challenge is communications for UA. Work at ICAO to identify how UA will fit into Air Traffic Systems is ongoing. This will be a future challenge for CAA, Airways and NSS as UA operations mature and place greater demand on the need for system integration.

Performance-based communication and surveillance (PBCS)

52. The NSS performance-based communication and surveillance (PBCS) plan was implemented in the Oceanic FIR on 30 March 2018. It provides objective operational criteria to evaluate different and emerging communication and surveillance technologies, intended for evolving air traffic management (ATM) operations. The PBCS also provides a framework in which all stakeholders (regulators, air traffic service providers, operators, communication service providers (CSP), and manufacturers) continue to collaborate in optimizing the use of available airspace while identifying and mitigating safety risks.

53. The PBCS concept is aligned with that of PBN. While the PBN concept applies RNP and RNAV specifications to the navigation element, the PBCS concept applies required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. However, there are some differences between the PBCS and PBN concepts:

    a. The PBCS concept applies RCP and RSP specifications, which allocate criteria to ATS provision, including communication services, aircraft capability, and the aircraft operator; whereas the PBN concept applies RNP/RNAV specifications, which allocate criteria only to the aircraft capability and the aircraft operator.

    b. The PBCS concept includes post-implementation monitoring programmes, on a local and regional basis, with global exchange of information; whereas the PBN concept includes real time monitoring and alerting functionality in the aircraft capability.

Aeronautical Information Management – Digital integration

54. Aeronautical Information Services (AIS) will allow continuous, up-to-date and real-time information transfer, moving to Aeronautical Information Management (AIM).

55. Aeronautical information will be created, managed and distributed via modern data driven systems, using common software standards. This technology will enable statutory AIM information to be communicated to users in more useful formats with greater detail and less manual handling required.

56. In addition, through the application of System Wide Information Management (SWIM) principles, AIM systems will integrate with complementary sources of

information such as weather, runway conditions, and air traffic reports. Combined together and with the ability to update in near real-time, this consolidated information presents a more complete view of the operational environment at any given time.

57. Further development will see visual information replace textual content where possible to improve the speed with which users can ingest and comprehend the combined information.

58. Taken together, information visualised and fed from common, certified sources will provide benefits to aviation users through increased situational awareness before, during and after operations as well as saving considerable time locating and digesting information. It also ensures that all users, regardless of their method of receiving information (paper, data feed, electronic flight bag, etc), will be able to see the same version at all times. It also sets the foundation for a future of manned and UA operating in an integrated system.

Air Traffic Management – From controlling to enabling

59. The ATM system will enable rather than control air traffic.

60. The ATM system is based on the provision of services with a view to becoming air traffic enabling, rather than air traffic controlling. Modern ATM tools, combined with the new surveillance, information, and navigation technologies, plus high resolution meteorological data will ensure more efficient flow management and conflict detection – reducing operator costs and improving safety. Procedures for contingency and recovery operations will be in place.

61. ATM should also support flight training in an integrated and cohesive manner. Various options will be investigated and potentially adopted in order to manage ATC capacity and support training flights alongside other traffic. These options will likely include the continuance of air traffic prioritisation, development, and ongoing support to sector booking systems, and potential development of 'sandpit' areas and associated procedure design to provide segregation. It is recognised that simulation is becoming increasingly available and will mitigate the burden to some degree. Equally, however, simulation may not be a viable option for all, and may not fully replace actual flight time. Development work around 'sandpit' areas are presently focussed on costs to establish and maintain, and what level of support they would receive.

Airspace Design – review and refine

62. The principle driver of Airspace design and designations will be flexibility. This is to accommodate increasing traffic, new types of aircraft and more direct and efficient flight paths, including UA activity and rocket launch sites.

63. UA will have significant economic and social impact at the national level across a number of industry sectors. UA will influence urban mobility as technology becomes

more affordable and functional. There are already over twenty current Unmanned Traffic Management (UTM) systems[7] [8] . UA operators will be able to seek necessary airspace and public landowner approvals to fly, file flight plans, and access near real-time information about other aircraft in the area, allowing them to stay safely separated[9]. However UA operation and integration within the broader New Zealand Transport Sector is currently being considered as a component of a Ministry of Transport Future Vision. As such, it is too early to forecast possible outcomes for the New Zealand aviation system.

64. Increased flexibility in helicopter operations, for suitably equipped operators, has significant potential to improve reliability and safety and enhances the national security and resilience capability. Moreover, development of PBN infrastructure will contribute to the potential for economic growth in the regions and on a national level.

65. Even after benefits are derived from a comprehensive PBN environment, growth in air traffic volume may still result in efficiency decreases in high demand airspace subject to use from a mix of different types of aircraft types and operations (e.g. RPT, helicopters, and training). While airspace use may be limited on a 'best equipped, best served' basis, it is anticipated that a broad mix of well-equipped aircraft types will prevail in future. During periods of high demand, ATC will therefore continue to prioritise traffic depending on ATC capacity and the type and nature of operations[10].

66. To alleviate pressure and maintain efficiency in a PBN environment, blocks of airspace may need to be reserved to enable aeronautical activity such as training, to be conducted to meet the syllabus flight training requirements. Undertaking this reservation of airspace in a systematic manner at the national level ensures consistency in the IFR training environment, a consistent approach to PBN development, and integration into the overarching ATM environment.

67. Processes inclusive of consultation for changes to New Zealand airspace design and designations will be more efficient as the majority of operators equip appropriately to take advantage of the NSS system.

Aerodromes – increasing capacity

68. Airports will be subject to increased pressure from urban land uses particularly residential intensification. Aircraft noise from flight operations and maintenance will

[7] Listed by EuroControl as of 8 May 2018.

[8] In New Zealand, Airways has partnered with global airspace management provider AirMap to deliver the platform that provides flight planning and management tools for commercial and recreational UAV pilots.

[9] A three month trial has been completed in the Canterbury and Queenstown regions.

[10] See AIP NZ ENR 1.1 sub-section 10 Traffic Priorities.

require continued management and active land use planning. At the same time, accessible airports for both passengers and operators, with the associated benefits of air transport activities, will be increasingly valued by their regions.

69. Aerodrome Master Planning will ensure that core airfield infrastructure capacity keeps pace with forecast growth demand. Airport management will be driven by a collaborative process with all users, linking both airspace management requirements and land management planning to ensure a seamless service for passengers, operators and service providers. Changes in the Airspace and Air Navigation system will enable more aircraft movements, which may provide challenges to some aerodromes and associated airfield infrastructure.

70. The GBNA report recommendations propose a reduced number of national terrestrial NAVAIDS. In a number of instances, this may result in reduced access by IFR aircraft to some towns or regions within NZ. This situation does not preclude regional aerodrome operators from determining their own benefits derived from continued air access (e.g. economic, lifeline, resilience, and security). Operational decisions may include development or upkeep of GNSS based approaches or installing a terrestrial based NAVAID and associated instrument approach procedures.

71. Operational planning and interaction between international aerodrome operators[11], Airways and aircraft operators will be enabled and coordinated through A-CDM.

72. A-CDM integrated at Auckland, Wellington, Christchurch, and Queenstown will assist in enhancing resilience nationally across major domestic air traffic routes and at the major international gateways[12].

73. Network connectivity options and system architecture will need to be considered based on advantages, disadvantages, and cost benefit outcomes.

Meteorological Services – Integrating MET information

74. There has been significant progress in the delivery of MET to the aviation sector since the inception of the NSS programme, driven by four major themes:

    a. **Resilience**: A new forecasting office in Auckland to complement the Wellington office means the provision of weather services is now more resilient to interruption.

    b. **Enhanced data delivery and display systems:** Modern platforms now deliver richer information in a user-friendly format, with a MET CDM tool providing

[11] Auckland International Airport has implemented Airport Capacity Enhancement (ACE)

[12] Auckland, Wellington, Christchurch and Queenstown are the main domestic and international airports, these four airports account for approximately 87% of all passenger traffic.

immediate insight into weather affecting key airports and their immediate surrounds, and APIs now capable of delivering data directly to partner applications, minimising communications overhead.

c. **Graphical Products:** Better representation of MET information through the use of graphics has resulted in information being presented in a consistent, easy to read format.

d. **New Observation technologies:** Improved information on threats to aviation operations are being supported with enhanced radar and lightning data delivered in near real time.

75. In the future MetService will continue to build on these themes to deliver better services, leveraging global partnerships to develop new capabilities through applied R&D and innovation. This will be based on advances in high resolution modelling and observing technologies (such as LIDAR profilers and satellite remote sensing) to enhance MET information for airports, airlines and air traffic management services. This endeavour will focus on understanding and managing impacts in challenging areas of aviation meteorology including airport fog and severe weather, wind shear, turbulence and icing risk. These, together with PBN will help enable a safer, more efficient, seamless air traffic management system.

76. We will also use the ICAO MET Information Exchange Model (IWXXM) to provide a common format for MET data exchange across the region, enabling improved integration with modern aeronautical information systems. Integration of MET data with other systems will enable real-time MET information to be provided directly to users, including into the cockpit.

Information Management

Many of the benefits promised by NSS will be derived from effective information management

77. SWIM is an advanced technology concept designed to facilitate greater sharing of aviation system information, such as airport operational status, weather information, flight data and status of special use airspace. SWIM implementation is the optimal outcome for the aviation system in the conversion of digital data to information for systems users.

78. SWIM will use commercial off-the-shelf hardware and software to support a Service Oriented Architecture (SOA) that will facilitate the addition of new systems and data exchanges, and increase common situational awareness. SWIM will make information readily accessible in a timely way for all users of the aviation system.

79. SWIM implementation will improve the New Zealand aviation system's ability to manage the efficient flow of information. This includes:

    a. Reducing costs for all users to acquire data

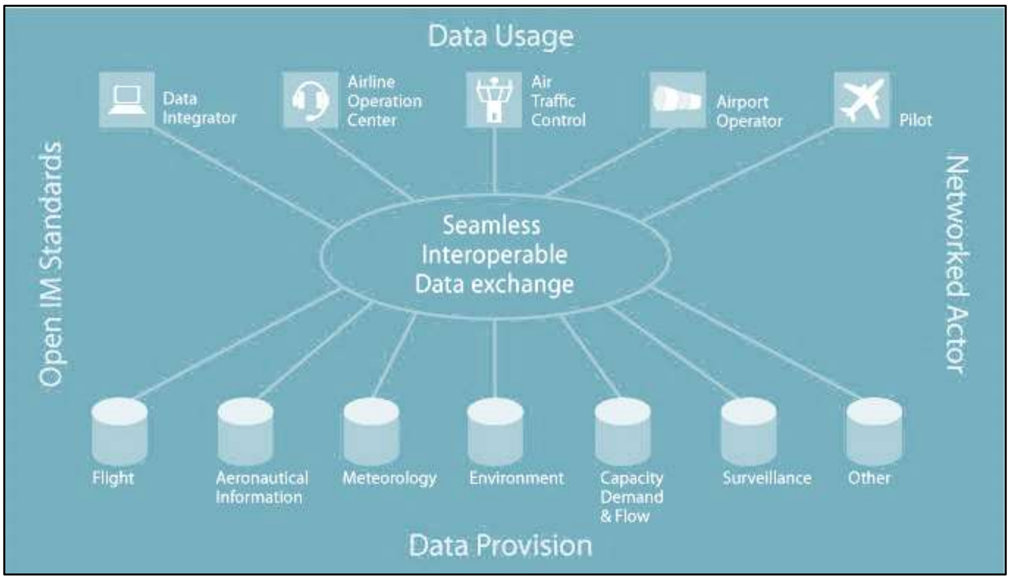
    b. Improving shared situational awareness among the user community

    c. Providing secure data exchange that meets current New Zealand security standards

80. CONOPS recognises that global interoperability and standardisation are essential and SWIM will be an important driver for new and updated standards.

81. The CONOPS assumes that SWIM will be based on SOA and open and standard mainstream technologies.

Figure 2: System Wide Information Management



82. The following information will at best be integrated, but at a minimum be shared:

a. **Aeronautical** - Information resulting from the assembly, analysis, and formatting of aeronautical data.

b. **Flight trajectory** – the detailed route of the aircraft defined in four dimensions (4D), so that the position of the aircraft is also defined with respect to the time component.

c. **Aerodrome operations** – the status of different aspects of the airport, including aircraft operations, runways, taxiways, gate and aircraft turn-around information.

d. **MET** – information on the past, current and future state of earth's atmosphere relevant for air traffic and ground operations.

e. **Air traffic flow** – the network management information necessary to understand the overall air traffic and air traffic services situation.

f. **Surveillance** – positioning information from surveillance systems, satellite navigation systems, aircraft datalinks, etc.

g. **Capacity and demand** – information on the airspace users' needs of services, access to airspace and airports and the aircraft already using it.

Figure 3 Current communication network versus NSS communication network

Figure 3: Current communication network

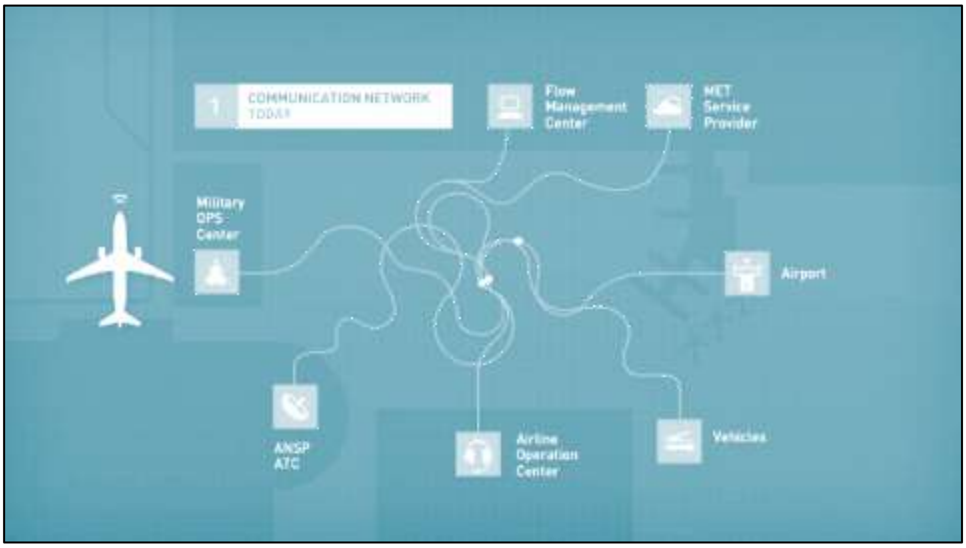
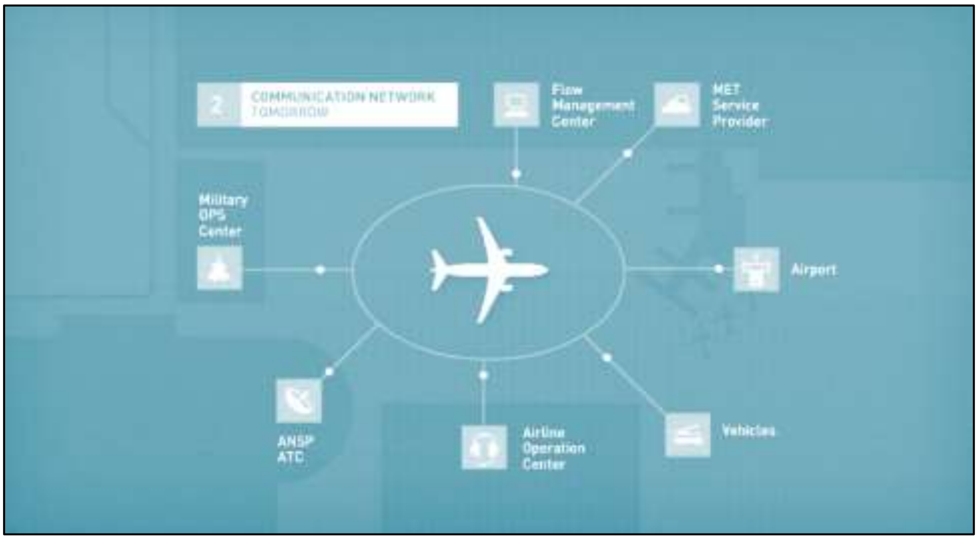


Figure 4: NSS communication network



83. The implementation to a full SWIM enabled environment is expected to be through a staged process. What is clear is that SWIM solutions need to be tailored, proportionate and sufficient to respond to New Zealand's operational and economic needs.

84. As New Zealand's traffic volumes rise and new aviation system entrants emerge, SWIM will contribute to mitigation of these issues. SWIM solutions need to be of appropriate scale, cost and effectiveness for the value of benefits that can be obtained. A SWIM service will be most effective if it enables applications developers to use mainstream technologies and data exchange standards. Harmonised international standards would help clarify and accelerate progress. The development of new technologies and the confluence of new ATM and surveillance systems at the

end of 2021, gives New Zealand a window to evaluate emerging SWIM concepts and solutions and to allow time for technology enablers to mature before 2023.

The Ground Environment

85. All aviation activity; GA, airline, freight, commercial or agricultural operation and airports are driven by the economics of efficiently moving aircraft, customers, freight or products in order to generate revenue and minimise costs. The effective use of the assets (infrastructure, aircraft, personnel, ground handling equipment etc.) drives the efficiency of the operation and therefore the economics of the business. A private aircraft operator has the same interest; the more efficiently the aircraft can be operated the more rewarding the experience of aircraft ownership.

86. The relationship between the most effective use of the assets and the efficiency of the operation is complementary. The former comes from a schedule able to meet airport and operator customer needs, and the efficiency of the service by how efficient the services or aircraft can be operated. Both are enabled by this CONOPS.

87. There will always be a requirement to balance the needs of the customer, aerodrome or aircraft owner, and therefore the economics, against the availability of the assets required to operate the service or aircraft use and the capacity of the network (ramp space, gate capacity, traffic flow, airspace etc.) to do so safely.

88. Capacity constraints (e.g. during Low Visibility Operations) may require prioritisation of types of operations and flights to deliver the best passenger and economic outcome.

89. The international airports of Auckland, Christchurch, Wellington and Queenstown will be making use of A-CDM to optimise the balance between demand and capacity. At peak times and during some MET events, there are capacity constraints due, to a greater or lesser extent, to the fact that each airfield is affected by only having a single runway in operation[13].

90. Real time schedules, MET reports and forecasts, departure information, surface movement, gates and arrivals information, flight planning routings and fuel uplift, ensuring passenger connections and the ability to minimise the impact of delays will be conducted via data messaging. Data messaging will have moved from AFTN to be delivered to aircraft via AMHS as the internet architecture that allows ground/ground, air/ground, and avionic data sub-networks to interoperate by

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[13] Christchurch Airport has intersecting cross runways, the airport does not have parallel runway capability

adopting common interface services and protocols based on the ISO[14] Open System Interconnection (OSI) Reference Model.

91. Voice communication on the ground will be via VoIP in preference to VHF as users migrate to suitably capable equipment. VHF will remain primary means in the air. International and domestic pre-departure, and some en-route and arrival clearances, will utilise data-link.

92. Ground surveillance will be supported to improve safety and capacity.

Equipage

93. Equipage requirements will change as regulatory frameworks develop. It follows that detail of aircraft equipage will be found in the relevant regulatory documentation. Examples are ADS-B equipage requirements which are embodied in Notice NTC 91.258 and PBN equipage which can be found in the PBN Implementation Plan Revised 2017 New Zealand Version 2.

[14] ISO – International Standardisation Organisation.

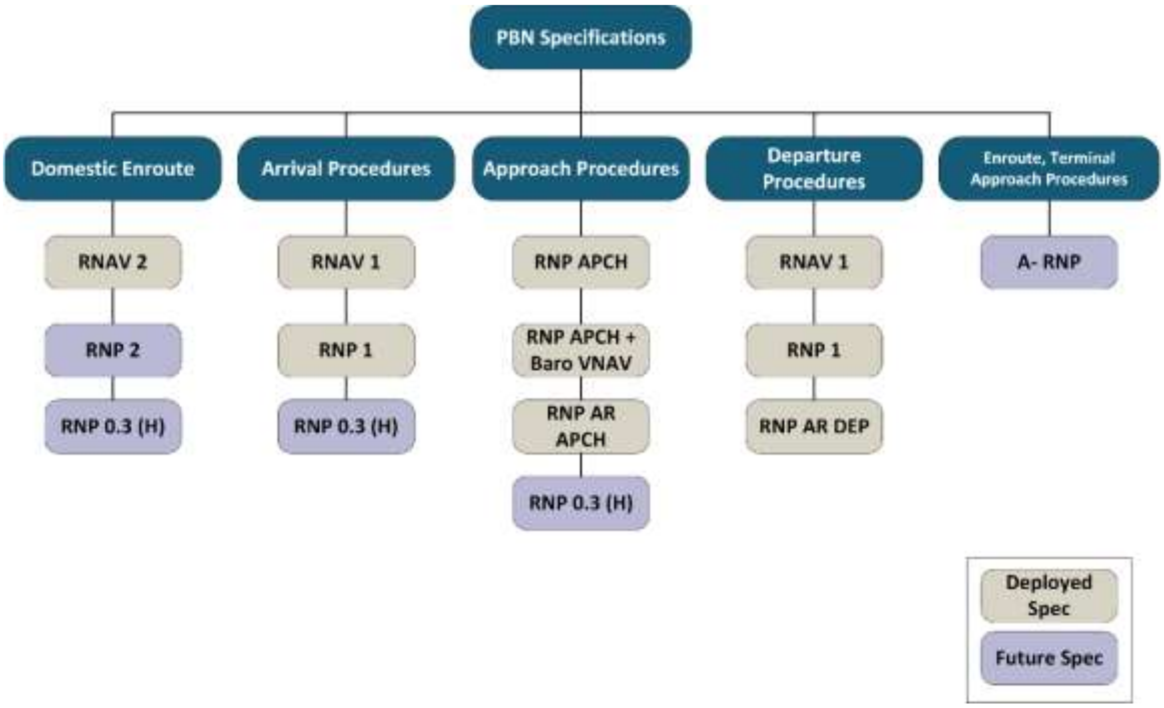
Layers of Airspace Use

94. A wide spectrum of New Zealand's aviation industry operates throughout the CA. At one end of the spectrum are international flights entering or departing the FIR, there are domestic jet operations in airspace above FL245, medium level RPT operations operating in the FL130 to FL245 range and lower level operations through to FL130. Corporate aircraft operate throughout this airspace range, as do some high performance gliders. General aviation, helicopters and increasingly, UA are safely integrated into the airspace below FL130.

95. The following scenarios will provide a detailed stakeholder view of how these airspace layers will be flown by operators and the capabilities they will employ for optimum efficiency and safety.

96. The specification for each scenario, in particular arrival and departures, is based on the following:

Figure 5: PBN Specifications

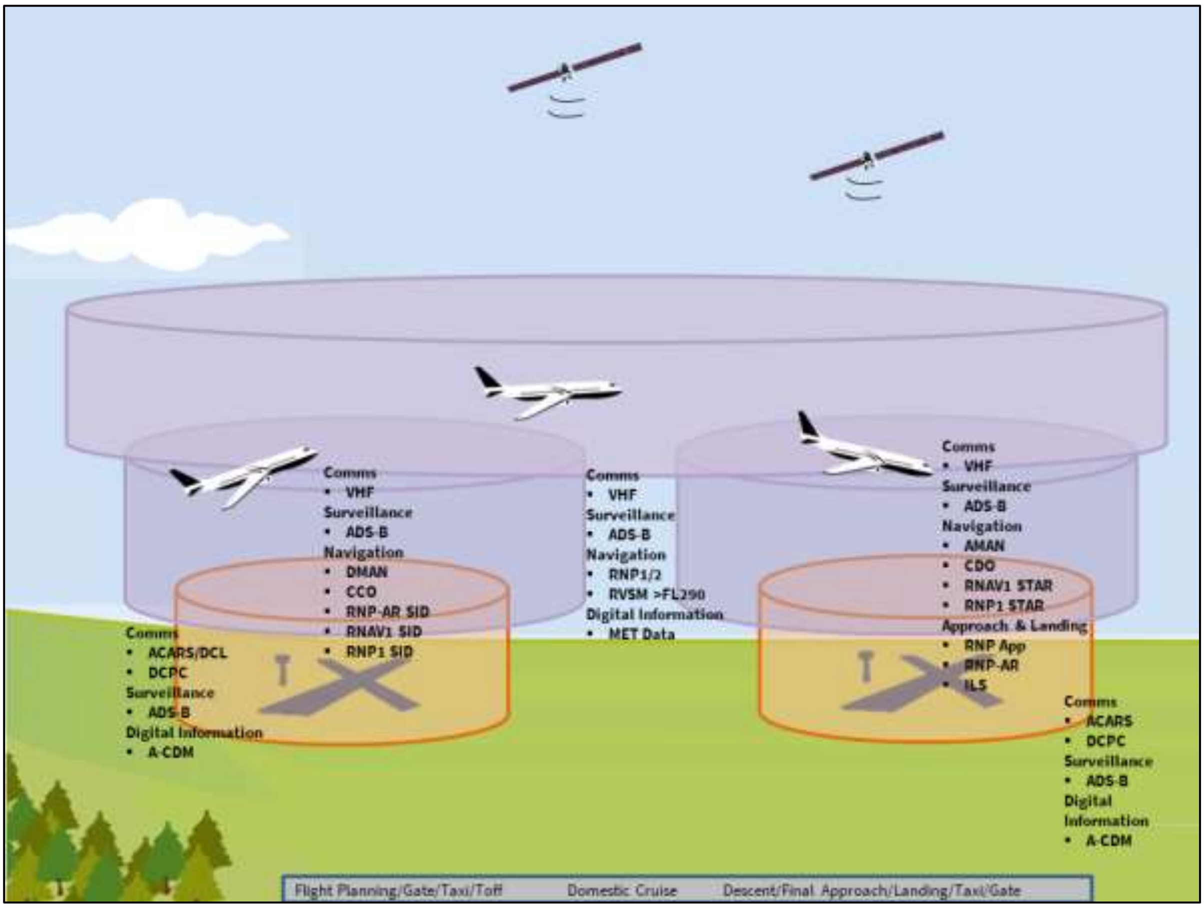


97. To continue operations in this modernised CA, some FTOs in New Zealand may have to undergo equipage upgrades for aging aircraft. Specifically, aircraft will need to be both ADS-B and RNAV/RNP capable for flight training purposes in CA.

98. Training aircraft suitably equipped and with ADS-B will enable more dynamic use of airspace close to airports where flight training is based from and is co-located with RPT operations. Some airspace, where there are high levels of RPT, may need to be designed with consideration for the performance limitations of new technology light aircraft.

FL245 and Above

Figure 6: Above FL245 Controlled Airspace



99. Integrated flight plan and MET data functionality will be implemented enabling geo-referenced pilot briefings. Aeronautical information data exchange between systems will be supported through SWIM.

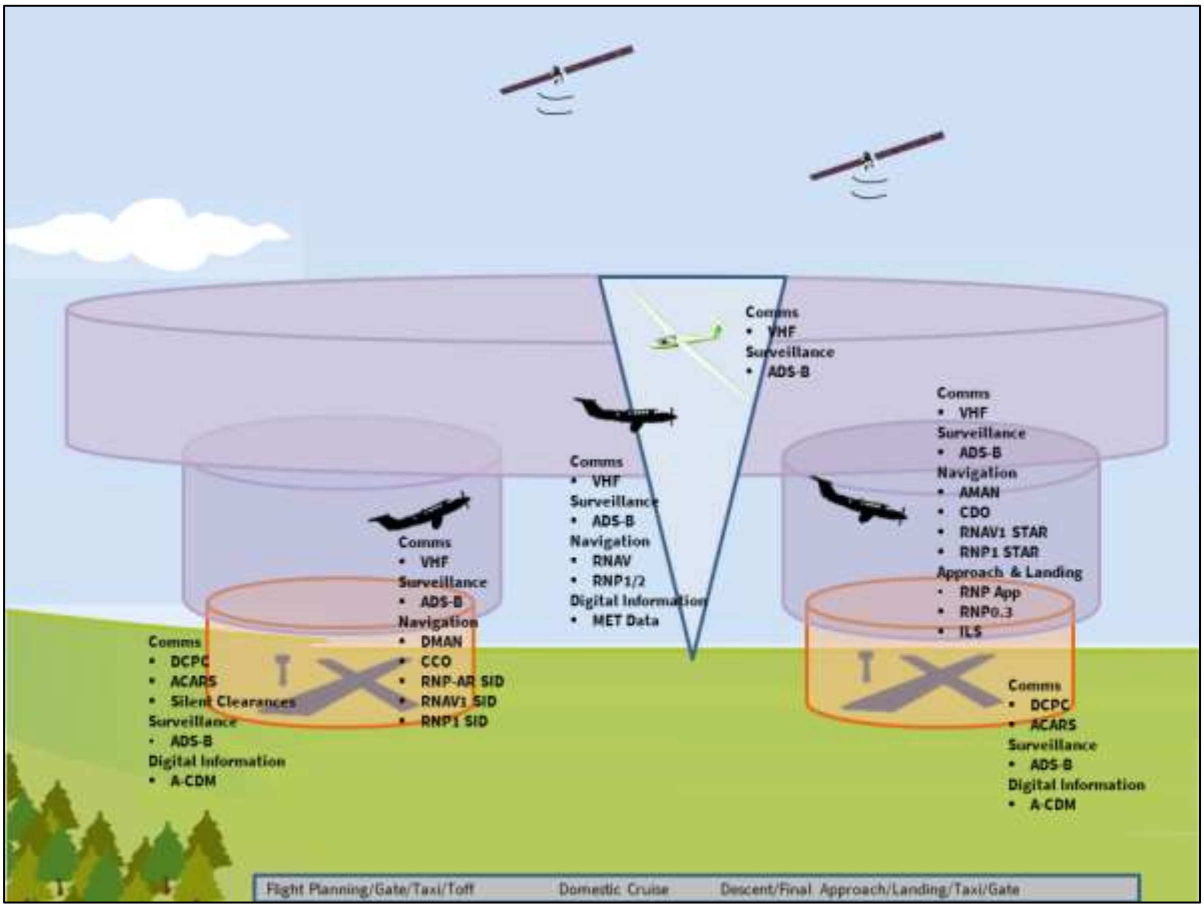
100. SIDs will be enabled by RNAV or RNP with Continuous Climb Operations (CCO). ATM will be enhanced through full surveillance coverage in CA to prevent aircraft being held at a sub-optimal altitude. All ATS routes will be enabled by RNAV PBN Specifications.

101. Surveillance coverage will be through ADS-B in all CA, supplemented by suitable non-cooperative surveillance systems to where airspace is designated dense and complex airspace. Continuous Descent Operations (CDO) will be facilitated through the use of PBN routes and arrivals management system (AMAN). All STARS will be enabled by RNAV or RNP. Integration of PBN STARS directly to all approaches with vertical guidance allows for both curved approaches and segmented approaches in an integrated system.

102. All controlled aerodrome runways with instrument approach procedures will be enabled by RNP; these approach procedures should be optimised to take advantage of vertical guidance Baro-VNAV or Satellite Based Augmentation System (SBAS).

FL130-245

Figure 7: Mid-Level FL130-245 Controlled Airspace



103. Integrated flight plan and MET data functionality will be implemented enabling geo-referenced pilot briefings. Aeronautical information data exchange between systems will be supported through SWIM.

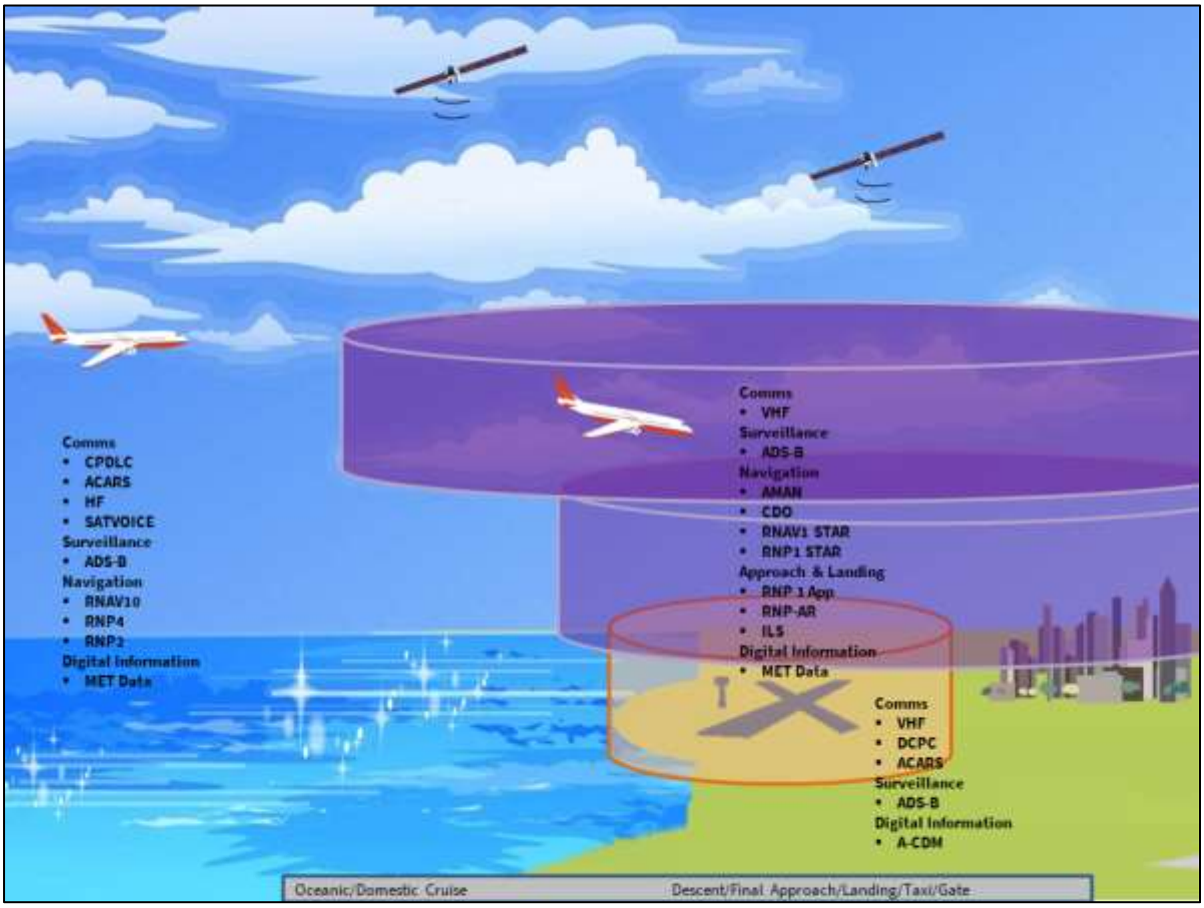
104. ATM will be enhanced through full surveillance coverage in CA to prevent aircraft being held at a sub-optimal altitude, which will reduce fuel burn. All ATS routes will be enabled by RNAV PBN specifications. Surveillance coverage will be enabled through ADS-B in all CA, supplemented by suitable non-cooperative surveillance systems to where airspace is designated dense and complex airspace.

105. Where Special Use Airspace (SUA) is adjacent to a CA, for efficiency, safety, and security of continued operations and to ensure effective use of the CA, civil aircraft using the SUA should be equipped appropriately, including VHF and ADS-B. However, equipage requirements in the SUA will ultimately depend on the operations conducted within that airspace. Transponder Mandatory airspace may not universally translate to ADS-B. Some uncontrolled SUA may only require lower order transponder requirements in order to support TCAS as this is likely to be more prevalent than aircraft with ADS-B (In) capability.

106. CDO will be provided through the use of PBN routes and AMAN. Vertical guidance will require Baro-VNAV or SBAS. With the latter aircraft will be able to take advantage of the lowest possible minima through the extension of GNSS approaches.

Oceanic Arrival and Departure to FIR

Figure 8: Oceanic arrival Controlled Airspace



107. Oceanic Navigation will be RNAV10, RNP4 or RNP2 in Oceanic airspace.

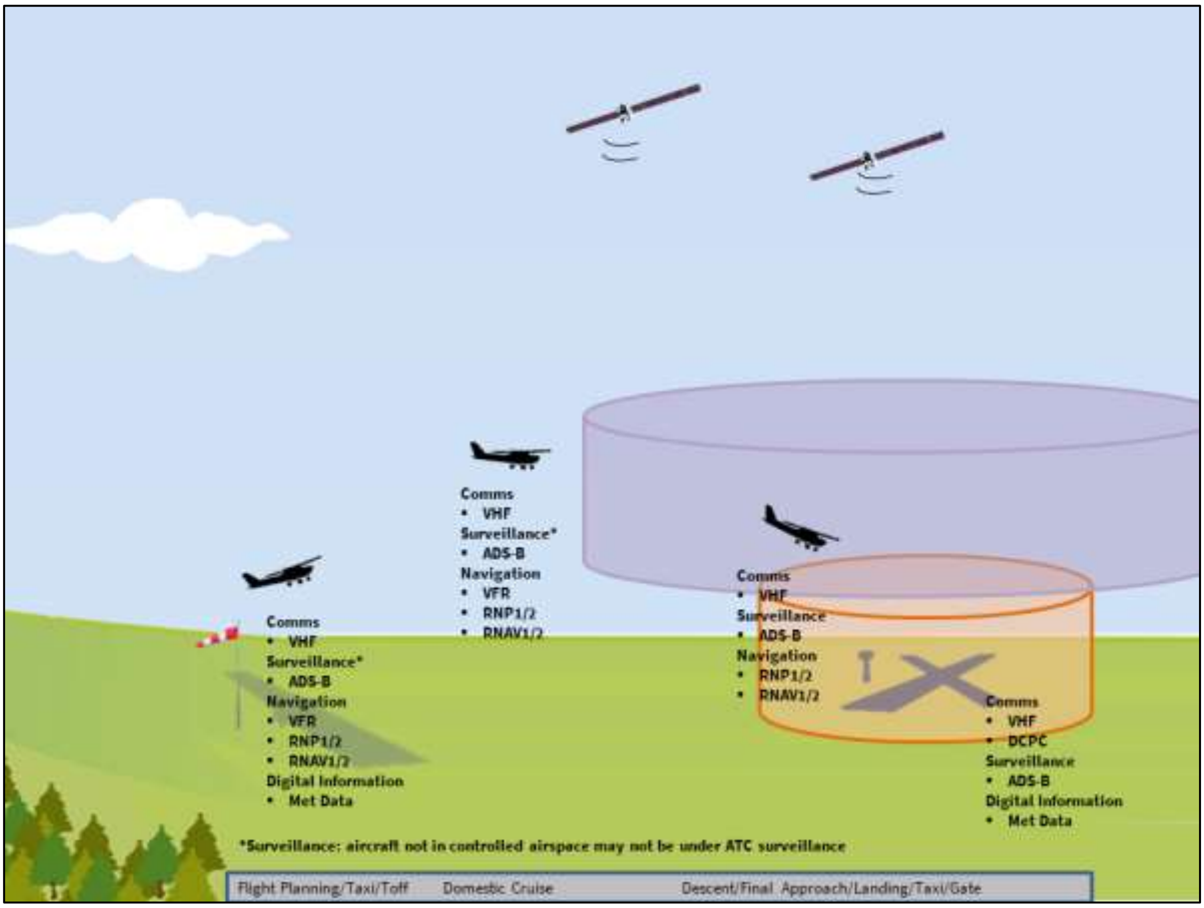
108. PBCS applies in Oceanic airspace[15]. Surveillance coverage will be enabled through ADS-B at the Oceanic/Domestic CA boundary.

109. On the ground, aircraft, ATM and ground systems generated data will enhance gate-to-gate traffic management services and incorporate safety alerting technology. A-CDM will be enabled at the main international airports.

[15] Since 30 March 2018

Surface to FL130 and VFR

Figure 9: Low Level IFR and VFR Controlled Airspace Below FL130



110. Recent accepted changes at ICAO will allow aircraft <5700kg and speed <200kts with map display capability and CDI minimum, to do RF hand flown curved approaches and departures. This change will enable optimisation of approach and departure procedures to/from uncontrolled aerodromes where the aircraft is then proceeding into or out of the CA.

111. The aircraft will have ADS-B for surveillance and VHF communications equipment for operations into CA. IFR capable light aircraft will be RNAV/RNP equipped for CA operations.

112. VHF will be the primary Controller Pilot Direct Communications (CPDC) in domestic airspace.

113. Where a SUA is adjacent to a CA, for efficiency, safety, and security of continued operations and to ensure effective use of the CA, civil aircraft using the SUA should be equipped appropriately, including VHF and ADS-B. However, equipage requirements within the SUA will ultimately depend on the operations conducted within that airspace. Where Transponder Mandatory SUA is not adjacent to CA, the transponder type may need to be reviewed against its intended purpose (e.g. supporting TCAS).

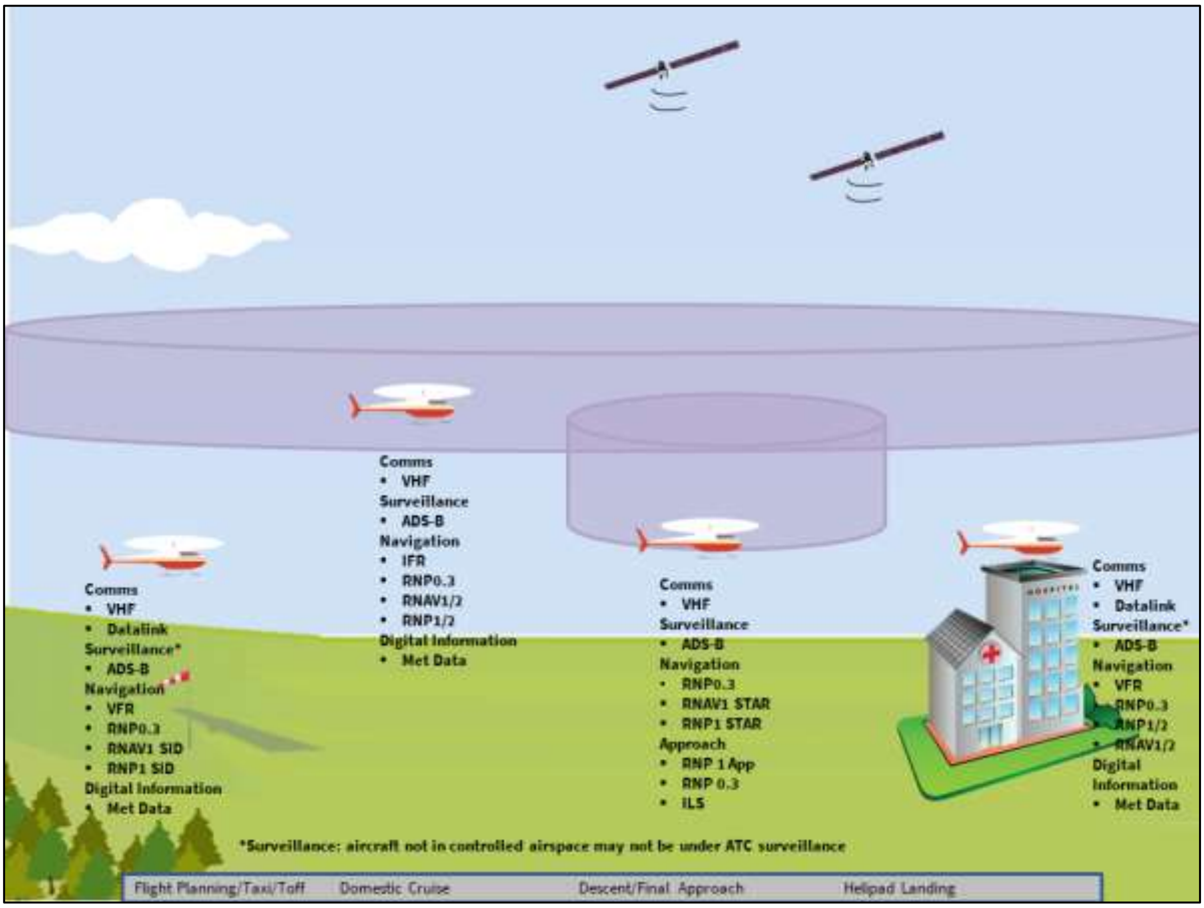
114. Performance-based airspace procedures will optimise the aircraft trajectory in the CA and provide efficient and effective use of airspace and traffic separation.

115. For the flight training industry sector blocks of allocated airspace might need to be recognised, as challenges with the implementation of NSS and commercial aviation industry sector growth impact on FTO operations. Overall, training needs to be accommodated within the ATM system in order to facilitate foundation training of New Zealand pilots; this will involve a mix of training means, including flight within and outside CA.

116. Increased use of synthetic trainers in the aviation training sector will alleviate some of the potential airspace congestion and wait time issues. However, it is acknowledged that the cost of suitable simulation training may be beyond the reach of many smaller training providers.

Helicopter Operations

Figure 10: Helicopter Operations Controlled Airspace



117. PBN unlocks the value of all-weather helicopter operations and it provides a number of operational solutions. It supports point-to-point trajectory-based flight operations that are unique to helicopters, independent of legacy ground-based navigation. It also allows helicopters to have all-weather access to low-altitude airspace, independent of fixed-wing traffic.

118. Suitably equipped helicopters can operate in Instrument Met Conditions (IMC), requiring less airspace using PBN, which could be further enhanced when supported by SBAS.

119. In addition to improved lateral containment compared to legacy ground-based navigation, PBN can provide vertical guidance in the form of localizer performance with vertical guidance (LPV) instrument approaches. Helicopter LPV or PinS instrument approaches is the equivalent of having an instrument landing system (ILS) at a heliport, provided there are appropriate augmentation systems.

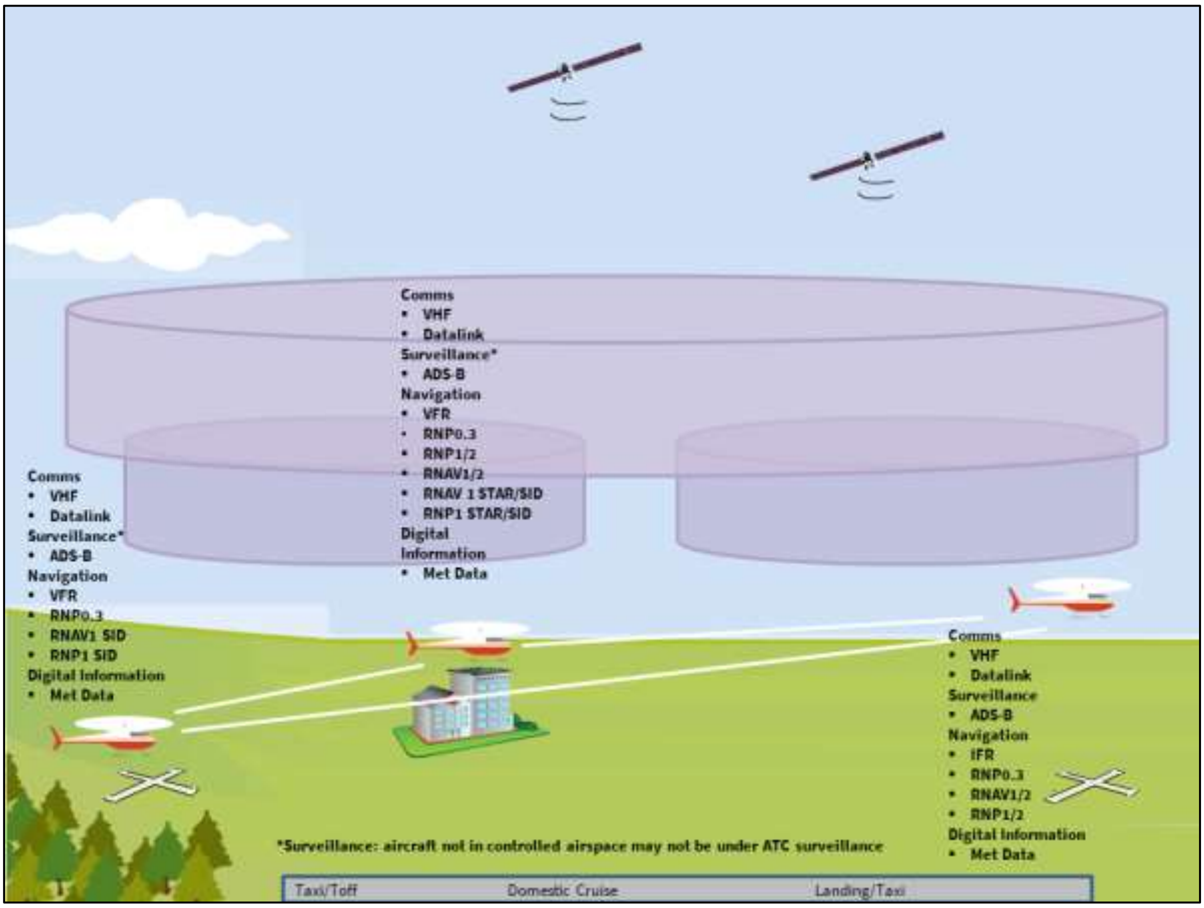
120. RNP 0.3 was developed in response to the helicopter community's desire for narrower IFR obstacle free areas to allow operations in obstacle rich environments and to allow simultaneous non-interfering operations in dense terminal airspace.

121. RNP 0.3 is a navigation specification for all phases of helicopter operations with a requirement for on-board navigation performance monitoring and alerting. Under this navigation specification, the required accuracy is 0.3 nautical miles (nm) for all phases of flight, which means that during operations in airspace or on ATS routes designated as RNP 0.3, the lateral total system error must be maintained within ±0.3 nm.

122. The main form of communications will remain VHF, however, some helicopters will be equipped to accept data link communications. Surveillance will be through ADS-B. Integrated flight plan and MET data functionality will be implemented enabling geo-referenced pilot briefings. Aeronautical information data exchange between systems will be supported through SWIM.

Helicopter Operations, Low Level and Uncontrolled Airspace

Figure 11: Helicopter Operations Low Level and Uncontrolled Airspace



123. RNP 0.3 enables design and development of low level routes (H), in mountainous terrain.

124. Aircraft operations will be over RNAV/RNP enabled low level routes to a network of instrument approaches enabling continued VFR operations. The routes and approaches will be in a mix of both controlled and uncontrolled airspace, including controlled airfields, uncontrolled airfields, reference points and heliports. RNP and LPV approach capability is a feature of suitably equipped helicopters. Enabling these capabilities will enhance safety and security of operations and increase the flexibility of operational capability for suitably equipped operators. This functionality has a wider context than the aviation industry, straddling New Zealand wider society across District Health Boards, Police, and local community impacts.

125. Taking benefits from new technology (and policy/regulations), using PBN can significantly improve daily helicopter operations. There needs to be support in the design and maintenance of the appropriate infrastructure:

a. Low level routes for helicopter operations

b. RNP 0.3 all phases of flight

c. PinS approach and departure

d. RNP approach PinS LPV

e. Helicopter Emergency Medical Services procedures (HEMS)

f. Ground support for flight validation

g. GNSS signal in space performance assessment

h. Implementation support for new procedures

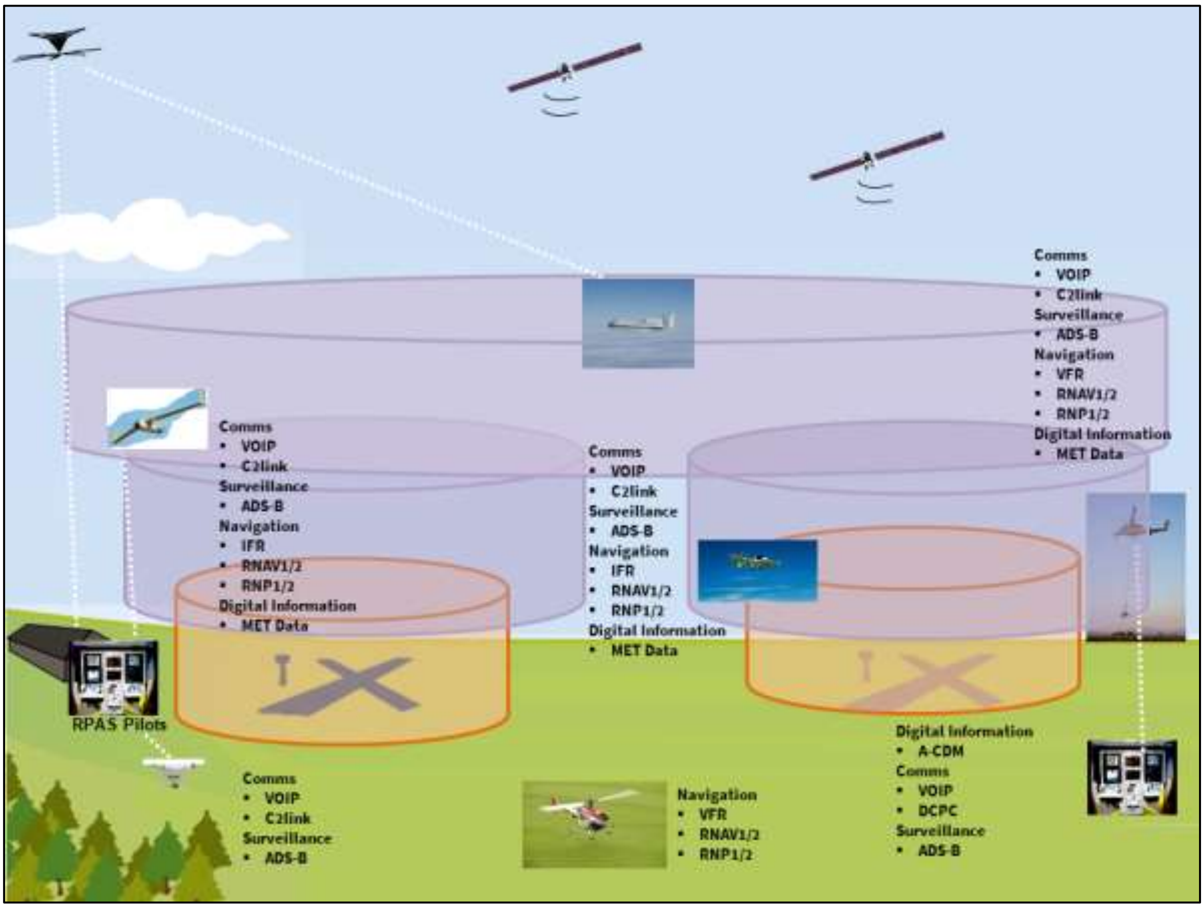
i. Maintenance of instrument flight procedures

126. The introduction of PBN enabled airspace in helicopter operations, will increase transitions from VFR to IFR and vice versa. This change may occur on several occasions during a mission. The current VFR operations mode will require a change in operating practice.

127. It will be important to provide the helicopter operations nationally with a durable low level route structure and associated approach and departure procedures.

Unmanned Aircraft

Figure 12: Unmanned Aircraft Operations Controlled Airspace



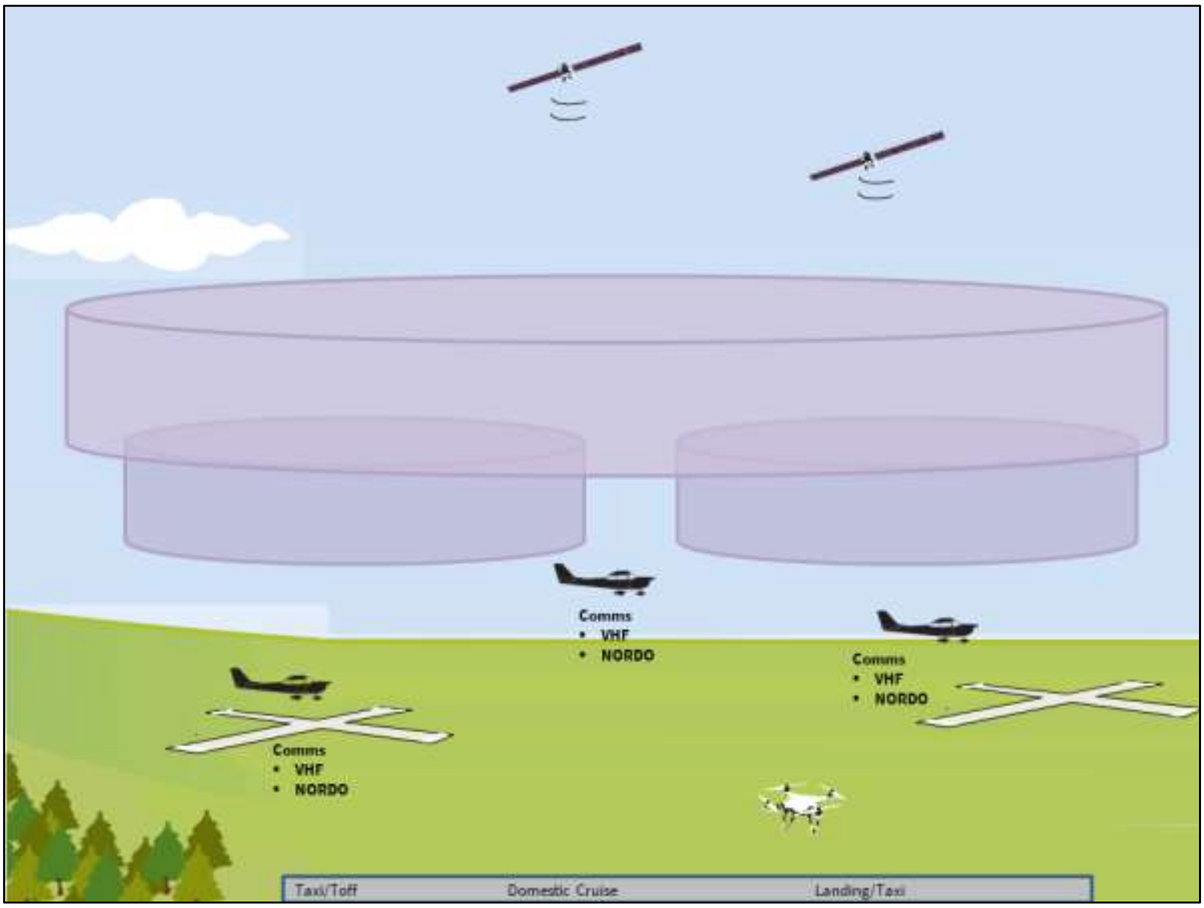
128. The CONOPS refer to operations under Part 102 operating outside of Part 101 requirements.

129. UA operation and integration within the broader New Zealand Transport Sector is currently being considered as a component of a Ministry of Transport Future Vision document. The document will set the policy framework that considers the safety, regulatory, economic, financial, social and environmental aspects of UA integration. As such, the CONOPS Sections below aim to capture future considerations for operations under Part 102 operating outside of Part 101 requirements

130. Consideration should be given to requirements for communication links to operate over protected aviation spectrum, under International Telecommunications Union (ITU) designations Aeronautical Mobile (Route) Service (AM(R)S) and Aeronautical Mobile Satellite (Route) Service (AMS(R)S). Future policy and regulatory requirements will reflect decisions as to whether UA should operate and be equipped as per the requirements for all other aircraft operating within the New Zealand aviation system; with regard to navigation, surveillance, communications/data links, and other relevant matters.

VFR

Figure 13: VFR Operations Uncontrolled Airspace



131. VFR inside CA would require a minimum expected equipage of ADS-B and VHF radio. Access would be management through the concept of 'best equipped best served'. During periods of high demand, ATC will continue to prioritise traffic depending on ATC capacity and the type and nature of operations16 There will be no requirement for ADS-B (Out) for VFR aircraft who do not enter controlled airspace. ADS-B (Out) and (In) will be promoted for situational awareness benefit, however CAA do not intend mandating its use outside controlled airspace.

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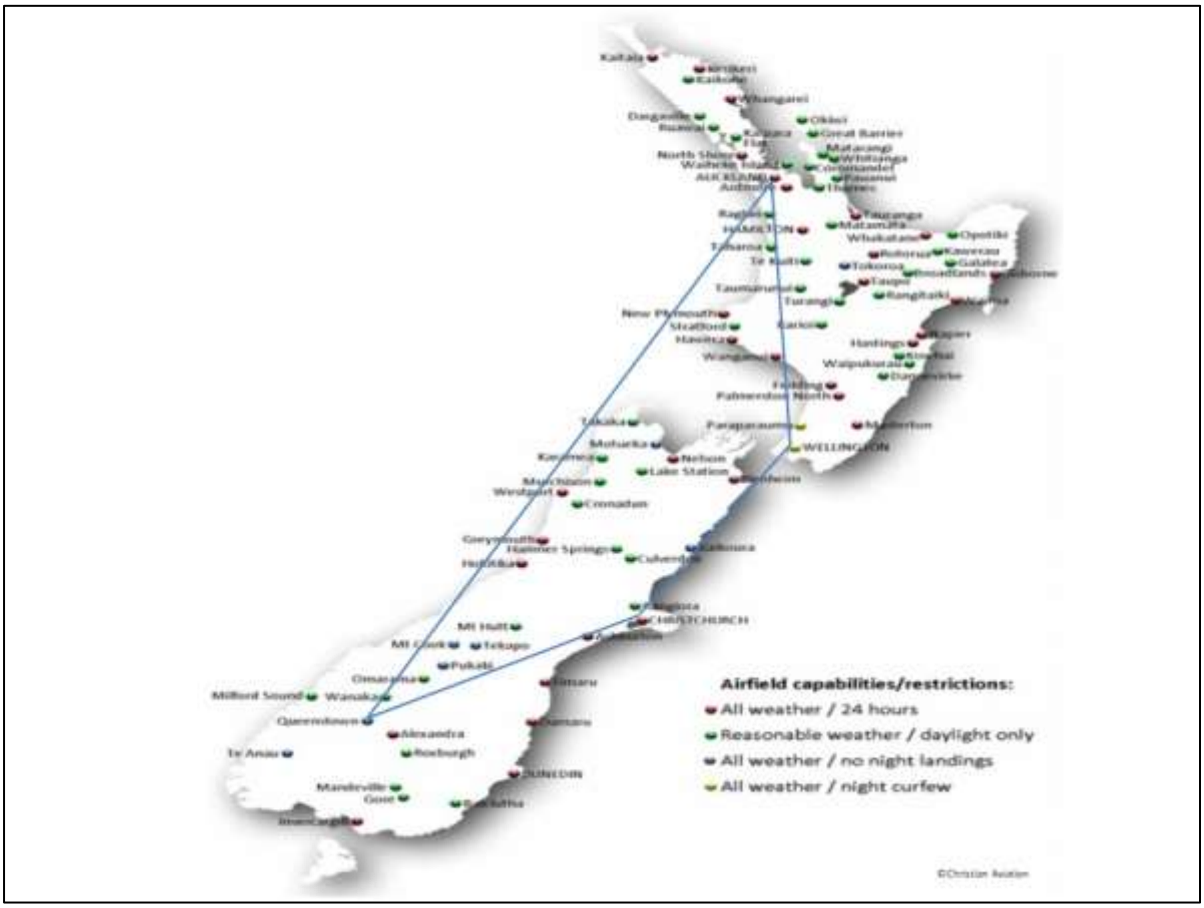
[16] See AIP NZ ENR 1.1 sub-section 10 Traffic Priorities.

Aerodromes

Figure 14: Airport CDM



132. New Zealand as a small country isolated from other countries and large populations relies on aviation for business, tourism and economic growth. The concept of A-CDM is to optimise traffic flows and improve airport throughput. Optimisation requires a broad mix of stakeholders working collaboratively to balance demand for infrastructure[17].

133. A-CDM benefits:

   a. Airfield optimisation
   b. Airspace optimisation
   c. Network resilience
   d. Passenger time saving
   e. Environmental improvements
   f. Organic ATK growth through enhanced reliability

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[17] Auckland, Wellington, Christchurch and Queenstown are the main domestic and international airports, these four airports account for approximately 87% of all passenger traffic.

134. The GBNA Infrastructure Strategy was based on a collaborative approach to GBNA rationalisation, which included MoT, CAA, ANSP, airports and both commercial and private operators; this process has been used to define the MON. Nevertheless, aerodromes inside and outside CA will retain the ability to represent regional needs, such as economics, lifeline airports, etc. to establish an investment pathway aligned to their navigation needs. Similarly, prime users of these aerodromes may influence what services are needed to support operations and help aerodromes outside CA make a decision based on their own drivers and needs.

CONOPS 2023

Figure 15: CONOPS 2023

		Controlled Airspace		Uncontrolled Airspace	STOP = Entry Clearance required				
new southern sky		Class A	Class C&D	Class G	SUA	Helicopters	RPAS/UAV	Glider	Airports
IFR	Comms	CPDLC ACARS HF SATVOICE	ACARS DCPC VHF	VHF	VHF	VHF DATALINK	VOIP C2Link		
IFR	Surveillance	ADS-B	ADS-B	ADS-B	ADS-B	ADS-B	ADS-B		
IFR – NAVIGATION	Departure		DMAN CCO RNP-AR RNAV1 RNP1	SID		RNP0.3 RNAV1 RNP1			
IFR – NAVIGATION	En-Route	RNAV10 RNP4 RNP2	RNAV1/2 RNP1/2 RVSM>FL290	RNAV1/2 RNP1/2 RVSM>FL290 RNP0.3(H)	RNAV1/2 RNP1/2 RVSM>FL290	RNP0.3 RNAV1 RNP1	RNAV1/2 RNP1/2 RVSM>FL290		
IFR – NAVIGATION	Approach & Landing		CDO RNAV1 RNP1 RNP-AR ILS VOR/DME RNP APCH LPV	Uncontrolled Aerodromes RNP APCH RNP1 STAR		RNP0.3 RNAV1 RNP1 LPV			
IFR	Digital Information	Met Data ADMS	A-CDM ADMS Met Data	Met Data	Met Data	ADMS Met Data	Met Data		A-CDM
VFR	Comms		VHF	VHF NORDO	VHF	VHF NORDO	VOIP C2Link	VHF	
VFR	Surveillance		ADS-B				ADS-B	ADS-B (In CA only)	
VFR	Navigation		RNAV1/2 RNP1/2 VFC	VFC	VFC	RNP0.3 RNAV1 RNP1 VFC	RNAV1/2 RNP1/2	VFC	
VFR	Digital Information		ADMS Met Data			ADMS Met Data	Met Data	Met Data	ADMS
VFR	Approach & Landing		RNAV1 RNP1						

135. In 2023, at the end of NSS Stage 3 we will see greater use of digital data, providing a rich environment for information dissemination to aviation systems users. Optimal use of airspace will be achieved through suitably equipped aircraft operating in this airspace. This technology transition will be flexible, enabling growth in aircraft movements through the FIR and be able to accommodate aircraft with different layers of capability.

136. The design will be appropriate to New Zealand, providing operational ready airspace.

137. This CONOPS articulates what NSS will deliver to the New Zealand aviation system. Ultimately it will be enabled through appropriate policy, regulations, where needed, and users deploying the appropriate equipment. The CONOPS adds to the NSS strategy and objective outcomes work programme.

138. As policy, regulations, collaborations, and technology develop the concept will be reviewed to keep pace with these changes.

Appendix 1: System Component Overview Transition

Regulatory Framework

Fundamental to the success of NSS is an enabling regulatory framework. The review of rules and regulations to accommodate changes that support a safe, cohesive and resilient aviation system is a critical component of the transition.

Performance Based Navigation – Ground-based to Performance Based Navigation

PBN involves area navigation procedures that are more accurate and allow for shorter, more direct routes. The use of PBN will enhance the reliability and predictability of approaches resulting in improved airport accessibility.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Performance Based Navigation (PBN) – *Ground-based to performance based navigation*	Continued use of legacy navigation applications while PBN capability is progressively implemented in aircraft fleets and the supporting infrastructure. The ground infrastructure associated with legacy navigation systems will be reviewed and progressively adapted.	Move to a more exclusive PBN environment that places greater reliance on the level of PBN capability in the national fleet and infrastructure. The ATM system will be managing a more homogeneous navigation capability.	A mature PBN environment with a comprehensive fleet and infrastructure capability. Air traffic management tools complement airborne systems and enable the management of those aircraft that may experience temporary loss of PBN capability. Contingency ground infrastructure that enables all aircraft to safely return to the ground.
Status	Complete	In progress	In progress

Surveillance – Reducing our reliance on radar

Automatic Dependent Surveillance-Broadcast (ADS-B) technology is the primary method of air traffic control surveillance. PBCS will be used in Oceanic Airspace.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Surveillance – *Reducing our reliance on radar*	Planning for progressive implementation of ADS-B, including rule development and training and education programme development.	ADS-B exclusive airspace above FL 245 with supporting network of ADS-B receivers.	ADS-B exclusive in all controlled airspace. Some provision for back-up ground surveillance network and special areas for non-ADS-B equipped aircraft including non-cooperative surveillance systems to support recovery, contingency ops and non-cooperative target detection in dense and complex airspace.
Status	Complete	In progress	In progress

Communication – Incremental improvements

VHF will be the prime means of communication in the NZFIR with HF, SATVOICE, and PBCS for oceanic communication and digital data exchange where possible.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Communication – *incremental improvements*	Ongoing maintenance of the VHF network. Complete transition from AFTN to AMHS. Develop a policy for Remotely Piloted Aircraft.	International pre-departure clearances via data-link. Review demand for additional use of data-link technology. VoIP for ground and remote communications. Implement Remotely Piloted Aircraft Policy.	VHF communication remains the primary means of domestic communication. Approve SATVOICE as a primary means of communication in oceanic controlled airspace. Implement results of the review on Data-link technology. Transition to ATN protocol.
Status	Complete	In progress	In progress

Aeronautical Information Management – Digital integration

Aeronautical Information Services will allow continuous, up-to-date and real-time information transfer.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Aeronautical Information Management – *Digital integration*	Going digital: transition from AIS to AIM in accordance with ICAO roadmap.	Information management – system integration through common data standards and communications.	Real-time availability of aeronautical information and data into aircraft.
Status	Complete	In progress	In progress

Air Traffic Management – From controlling to enabling

The Air Traffic Management (ATM) system will enable rather than control air traffic.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Air Traffic Management – *From controlling to enabling*	Infrastructure, procedure and tool development towards trajectory-based management including education programmes.	Implementation of trajectory-based management tools, training programmes.	Trajectory-based management in place, supported by integrated information and collaborative processes.
Status	Complete	In progress	In progress

Airspace Design – Review and refine

Airspace will accommodate increasing traffic, new types of aircraft and more direct and efficient flight paths, including remotely piloted aircraft activity and rocket launch sites.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Airspace Design – *Review and refine*	Review existing designations and develop methodology and triggers for future reviews.	A full review of New Zealand airspace to be completed by this time.	Revised airspace in place, review options for transponder mandatory in uncontrolled airspace and for reduced need for control areas with greater use of aircraft self-separation.
Status	In progress	In progress	In progress

Aerodromes – increasing capacity

Airport management will link in with both airspace management requirements and land management planning to ensure a seamless service for passengers and operators.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Aerodromes – *increasing capacity*	Establish collaborative decision-making forums and ensure effective contingency plans are in place.	Ensure that New Zealand's network of airports can support the changes occurring in the airspace and air navigation system.	Aerodrome master plans have regard to objectives and actions set out in the Plan.
Status	Complete	In progress	In progress

Meteorological Services – Integrating MET information

Full integration of meteorological information into air traffic management and performance-based navigation applications will enable an interoperable, seamless air traffic management system.

	Stage 1 by end of 2015	Stage 2 by end of 2018	Stage 3 by end of 2023
Meteorological Services – *Integrating MET information*	Develop IWXXM format for MET reporting.	Integration of MET data with aeronautical information.	Real-time availability of MET data into aircraft.
Status	Complete	In progress	In progress

Appendix 2: SBAS[18]

SBAS is being considered by the Ministry of Transport and Land Information New Zealand as part of a wider intelligent transport system (ITS) capability. SBAS is a NSS work stream and the viability of SBAS to support approaches with vertical guidance is currently being assessed. The use of SBAS already exists in other ICAO states in a PBN environment[19]. In other parts of the world, the aviation technology to support SBAS exists today, comprising of geostationary satellites, ground monitoring and control stations, and airborne receivers. The airborne receivers are currently GNSS receivers with TSO-C145/146 functionality. There is growing optimism that the Australasian trial may see it available by 2023.

[18] https://www.linz.govt.nz/data/geodetic-services/australasian-sbas-trial

[19] Australia is to proceed with the formal acceptance and introduction of SBAS

Appendix 3: Definitions

The following are standard ICAO definitions (Doc 4444); reproduced here for clarity.

ATM: Air Traffic Management. The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management, and air traffic flow management – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

ATS: Air Traffic Service. A generic term meaning variously; flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

ATC: Air Traffic Control Service. A service provided for the purpose of:

a) Preventing collisions:

1. Between aircraft, and
2. On the manoeuvring area between aircraft and obstructions; and

b) Expediting and maintaining an orderly flow of traffic.

FIR: Flight Information Region. Airspace of defined dimensions in which flight information service and alerting service are provided.

FIS: Flight Information Service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

The following terms are used within, and for the purposes of, this report.

Contingency Situation: A non-normal situation following an unplanned event that has resulted in a loss of function or capability within the aviation system, and during which a fall-back or alternative mode of operation is required (Recovery or Contingency Operations). E.g. Loss of GNSS, partial or full loss of surveillance coverage, aircraft equipment failure etc. See and compare the definition of disruption below.

Contingency Operations: Operations conducted during a Contingency Situation that is expected to endure beyond the recovery phase. See Recovery Operation below.

Safety: The operating regime would be managed to ensure continued safe operations during the Contingency Operations.

Impact: A degradation of social connections and economic efficiency would be expected.

Continuity: Within the context of safety criteria; 'continuity' means the continued safe service or operation of the part of the system in question.

Complexity: The measure of complexity is dependent on the variety of factors, including a mix of aircraft types (e.g. equipment and aircraft performance), route structure, navigation/communication requirements, aerodrome structure, terrain, and airspace category.

Density: A measure of the number of aircraft versus airspace volume.

Disruption: A temporary, localised interruption to planned operations that does not require a change to the normal operation of the aviation system and so does not constitute a Contingency Situation.

- Safety: Safety continues to be assured through routine established procedures.
- Impact: Very limited economic disruption occurs.

Recovery Operation: The expected immediate operational response to a Contingency Situation.

- Safety: Procedures and fall-back system capability would ensure continued safety while aircraft are being recovered either onto the ground or into contingency operations.
- Impact: The priority will be to safely recover aircraft. Any other aviation activity will be limited during the recovery phase.

Integrity: The condition of being unimpaired or able to perform to the intended criteria, performance or meeting the design specification, internal consistency. Can be lack of, or corruption in, electronic data.

Interoperability: Interoperability is a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, in either implementation or access, without any restrictions

'Minimum Operational Network' (MON): The minimum NZ aviation regime considered necessary to support essential safe recovery and contingency operations following an extended GNSS system failure, or aircraft on-board equipment failure.

Risk: A function or measure of the consequence of a future event and the chance of that outcome occurring.

- In the context of aviation safety risk, the consequence is primarily a function of the number of people exposed to harm.
- Probability is a function of many local and system-wide factors and variables.

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