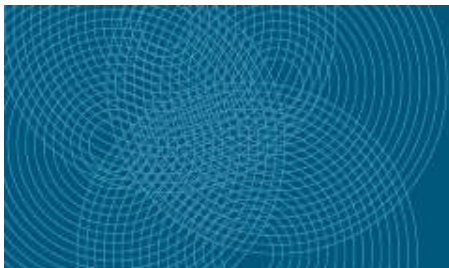




# ***New Southern Sky***

## ***Roadshow 2017***

To provide you with an understanding of how New Zealand's aviation system is being modernised



new  
southern  
sky

## **NORTH ISLAND**

Auckland Airport Monday 20<sup>th</sup> November 12.30-2.30pm

Ardmore Monday 20<sup>th</sup> November 6-8pm

North Shore Tuesday 21<sup>st</sup> November 11am-1pm

Tauranga Wednesday 22<sup>nd</sup> November 9-11am

Hamilton Wednesday 22<sup>nd</sup> November 3-5pm

Palmerston North Thursday 23<sup>rd</sup> November 11am-1pm

New Plymouth, Friday 24<sup>th</sup> November 10am-12 noon

Wellington Tuesday 5<sup>th</sup> December, 2pm-4pm

Napier TBA



## **SOUTH ISLAND**

Christchurch Monday 13<sup>th</sup> November 3-5pm

Nelson Monday 27<sup>th</sup> November 5-7pm

Christchurch Tuesday 28<sup>th</sup> November 5-7pm

Dunedin Wednesday 29<sup>th</sup> November 6-8pm

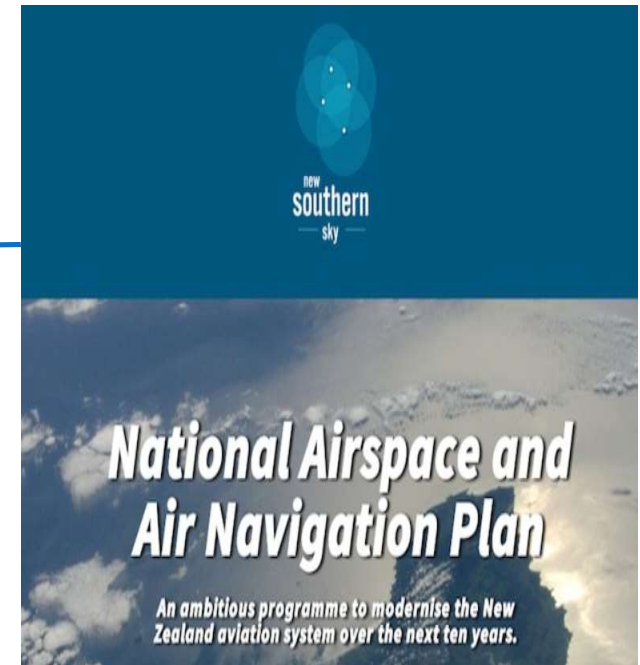
Invercargill Wednesday 29<sup>th</sup> November 6-8pm

Queenstown Thursday 30<sup>th</sup> November 7-9pm

# ***ICAO Global Air Navigation Plan (GANP)***



Linked



# ***National Airspace and Air Navigation Plan (NAANP)***



# ***Why a National Programme?***

- Prior to NSS the national aviation system had simply evolved
- Through NSS the opportunity has been taken re-design and refresh infrastructure to coordinate a range of initiatives into one system-focused, collaborative programme
- The result is that the benefits delivered by the programme as a whole are greater than the 'sum of the parts'.

# ***What we will talk about***

- We will introduce you to your NSS 'reps'
- Tell you what the programme is all about
- Let you know what the new surveillance system will likely mean to you
- Explain the opportunities that Performance Based Navigation might provide to you
- Outline some options for your kit

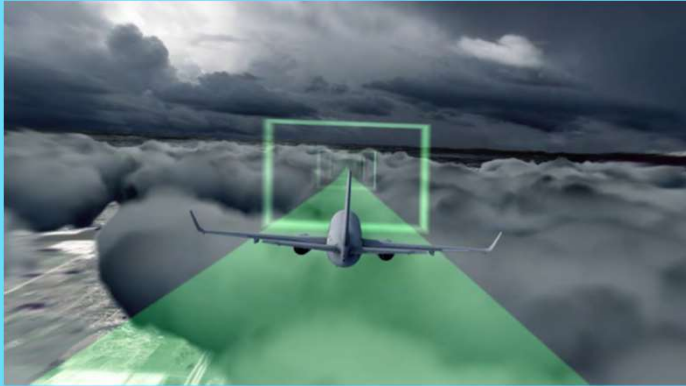


# *Along the way we will tell you about*

- The Ground Based Navigation Aid Strategy and the Review Panel recommendations
- The proposed ADS-B mandates
- How to get involved and influence outcomes

# ***What the programme is all about***

- Infrastructure delivered by stakeholders



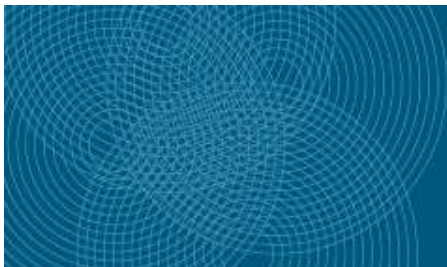
Digital



Physical

- Supported by regulatory enablers delivered by the CAA and MoT

***ADVISORY CIRCULARS/RULES/GUIDANCE***

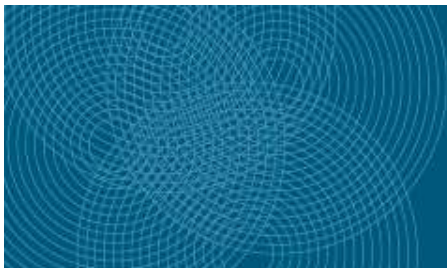


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**southern**  
sky



# ***New Southern Sky – Safer, Greener, Better***

- Safety
- Environmental
- Economic
- Social



# ***New Southern Sky – Safer, Greener, Better***

## Safety benefits

- Runway aligned approaches 25 times safer than circling approach
- Include vertical guidance - 8 times safer again
- PBN has protected 2.2M passengers per year



# ***New Southern Sky – Safer, Greener, Better***

## Environmental benefits

- Less CO2
- Less noise



# ***New Southern Sky – Safer, Greener, Better***

- Economic benefits
- Direct costs avoided
- Wider economic benefits



# New Southern Sky Working Group

IFR Helos



**AIRWAYS**  
making your world possible



**UAVNZ**



**AIR NEW ZEALAND**

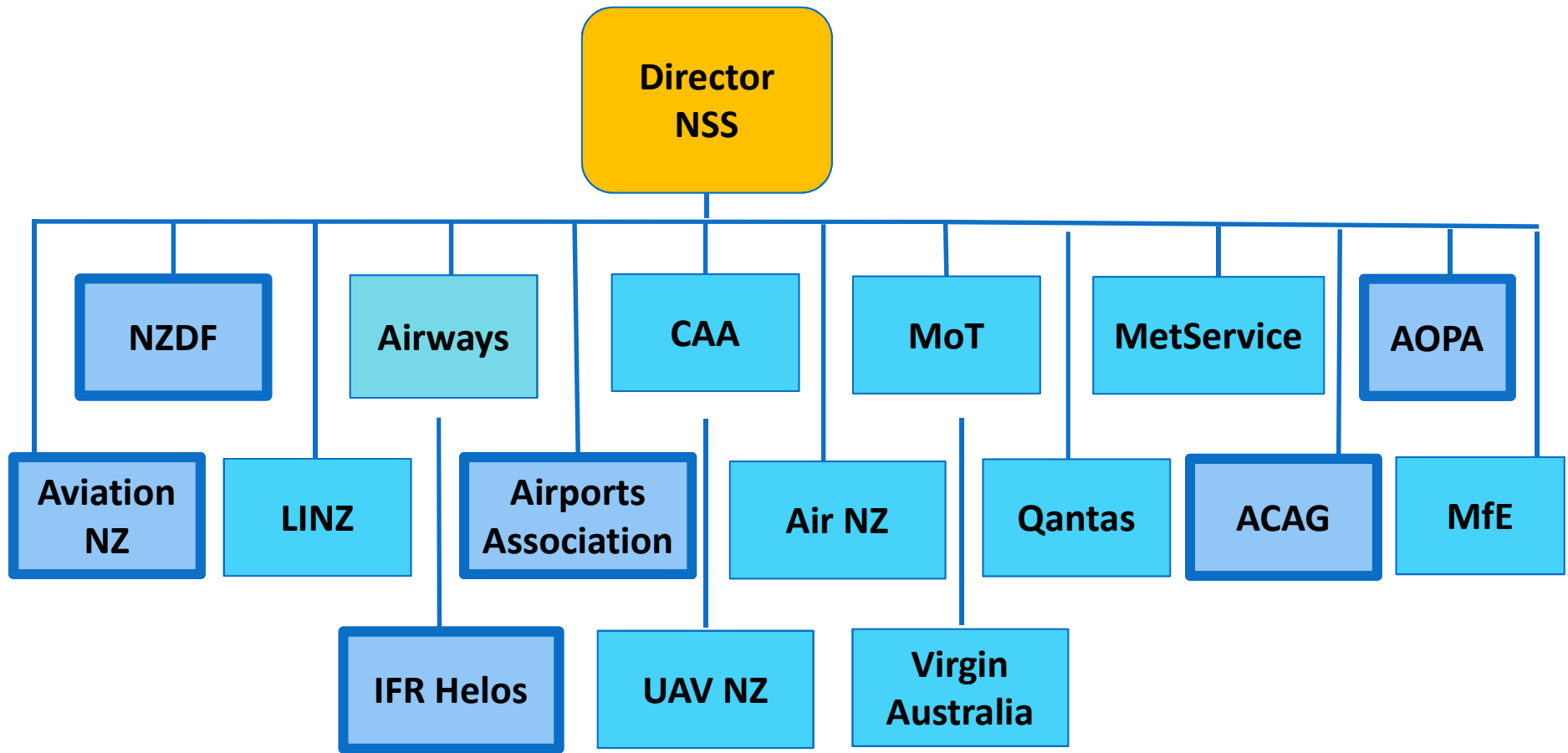


**ACAG**

new  
**southern**  
sky

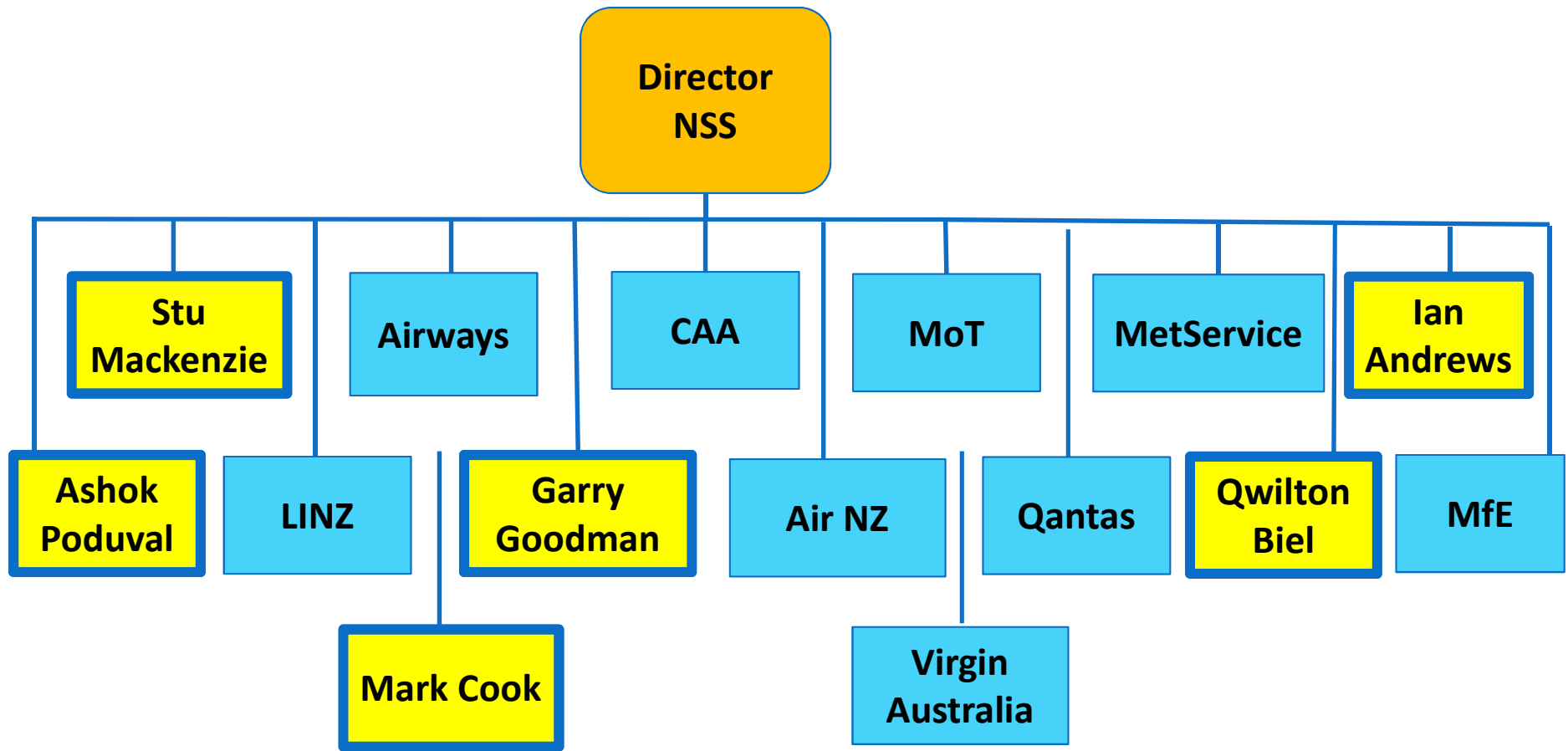


# *Working Group*

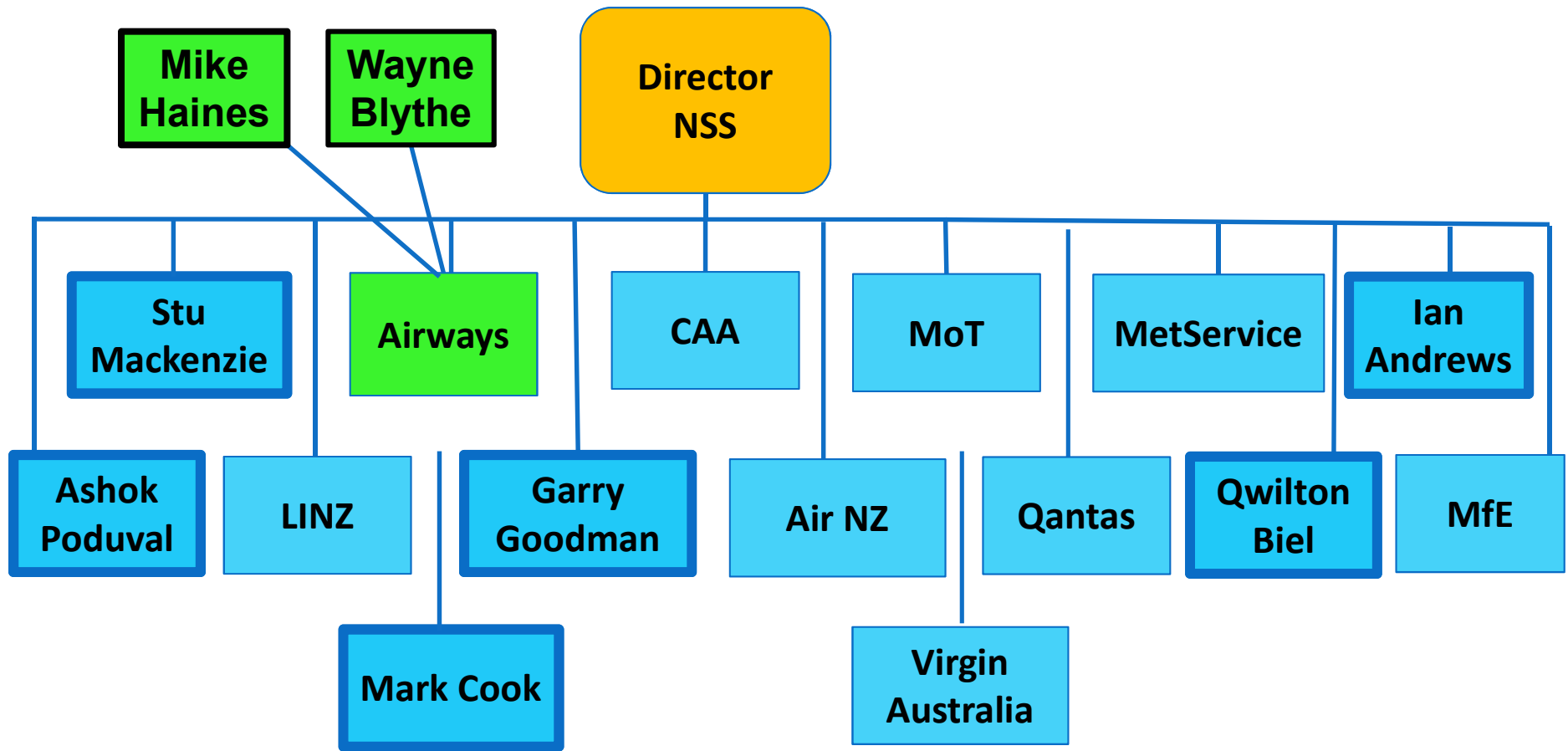




# *Your Programme Reps*



# *Your Programme Reps*



# ***Current NSS Sub-Groups***

Sean Rogers  
(CAA)

PBNIWG

National  
Security &  
Resilience

MoT  
(CAA)

Dave Harrison  
(CAA)

Flying  
Training

SWIM

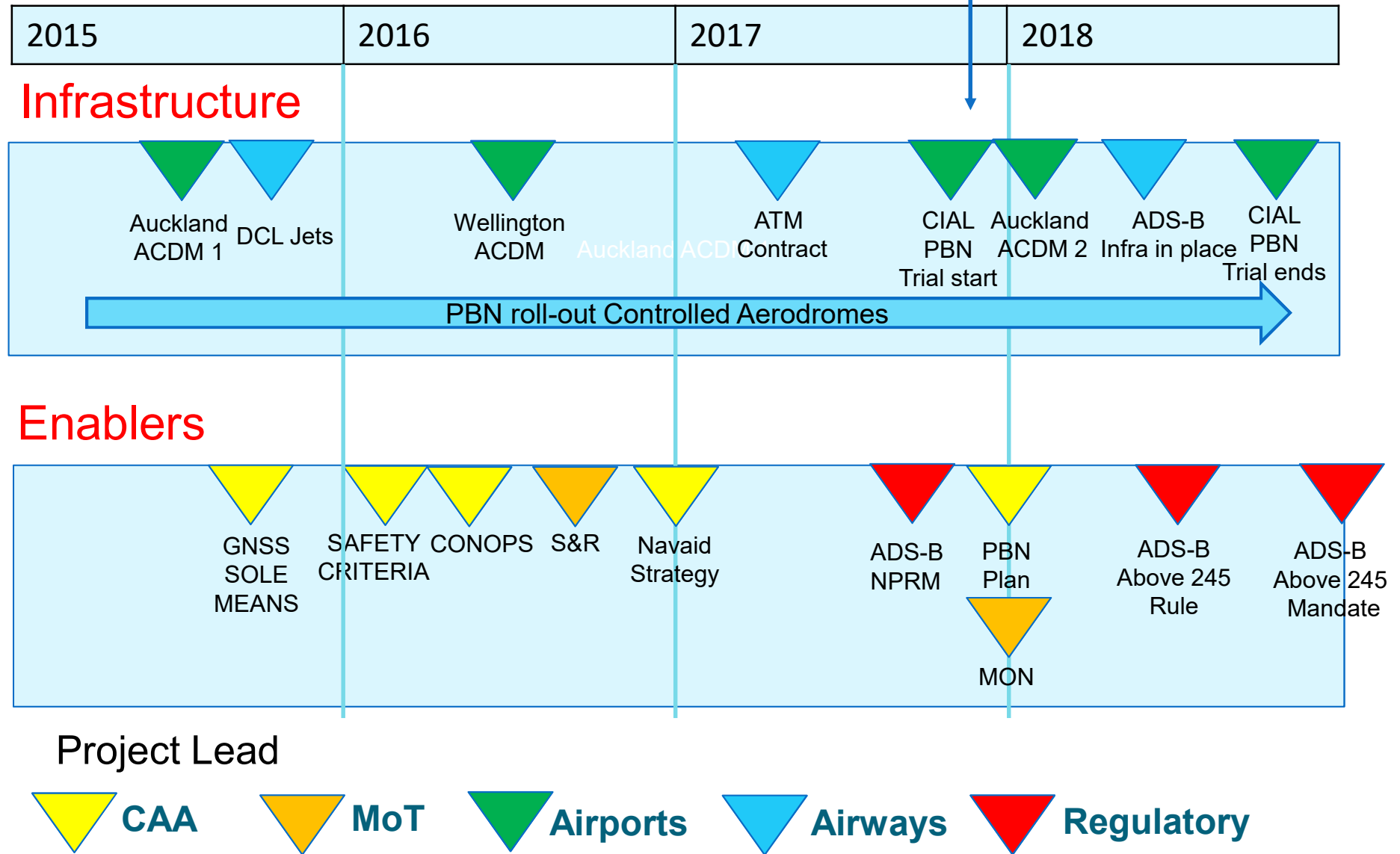
David Wills  
(CAA)

Future  
Surveillance

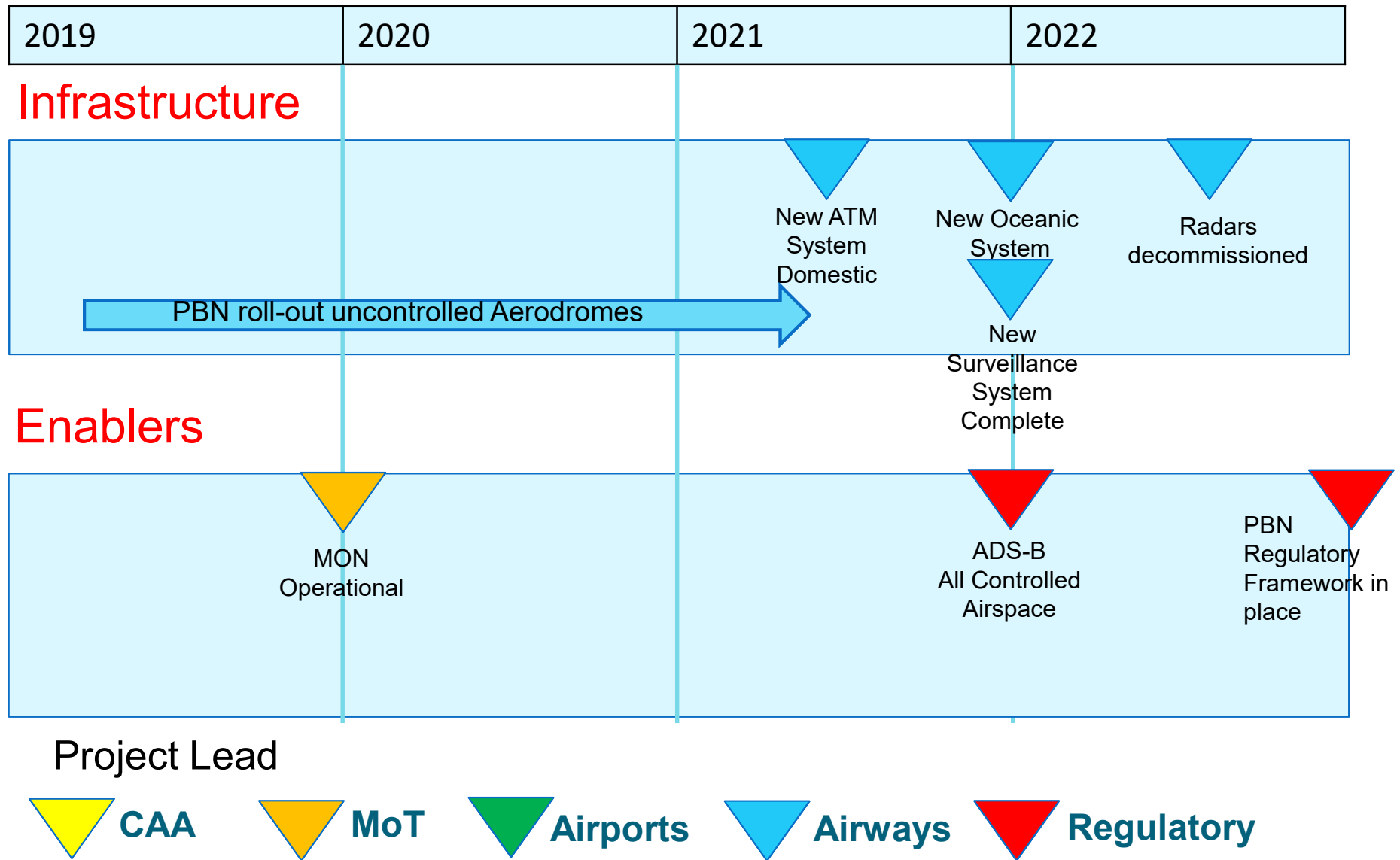
Brigid Borlase (CAA) &  
Wayne Blythe (Airways)

# Key Milestones

Today



# Major Milestones



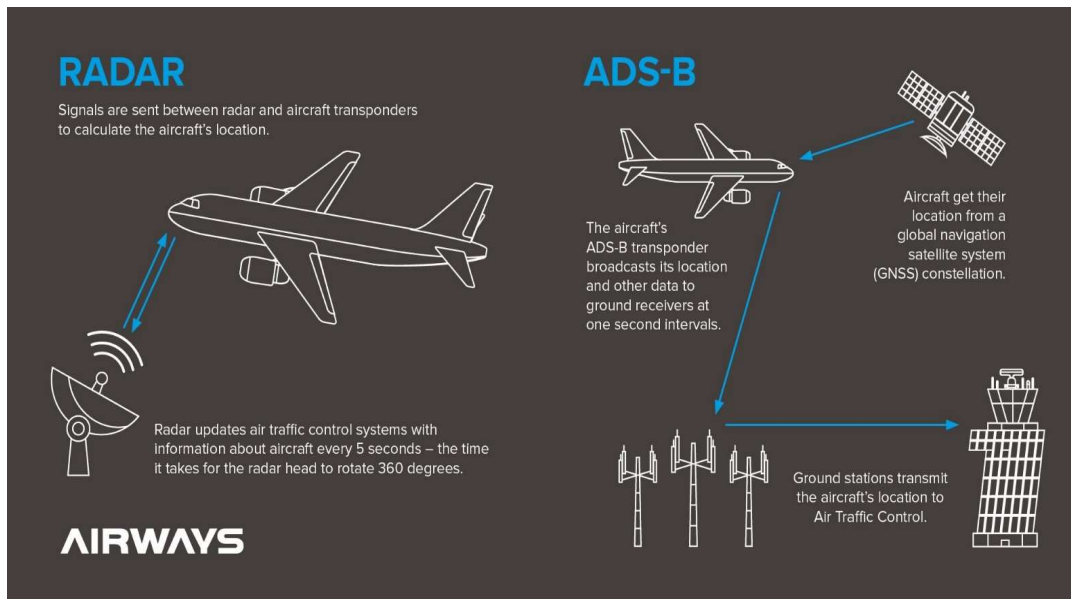


# *The new surveillance system*

*A co-operative approach*



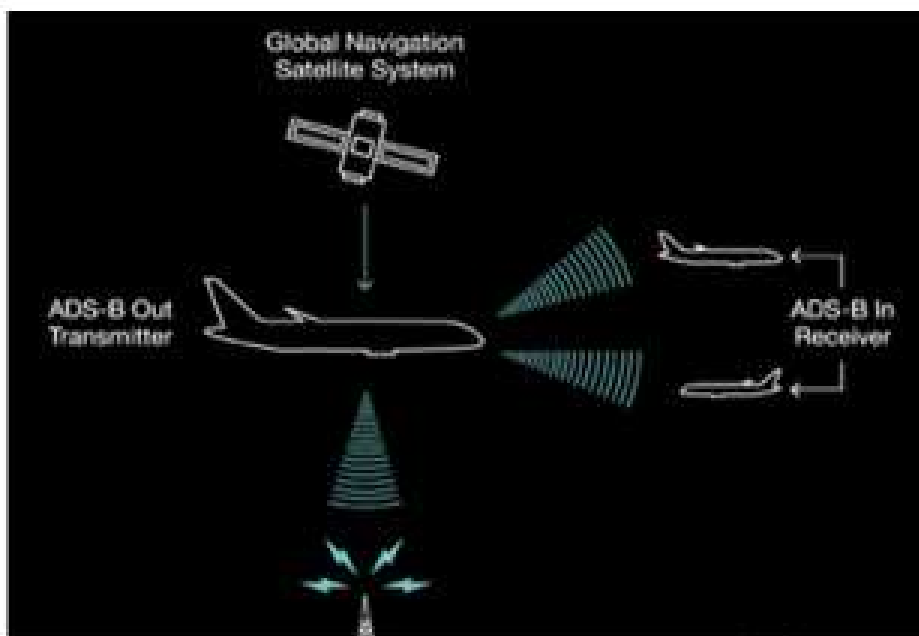
# ADS-B Out



ATC  
Workstation



## ADS-B IN



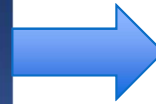
Integrated Cockpit Display

# *Future surveillance system*

## Secondary Surveillance Radar

### Characteristics;

- Calculates aircraft position
- High capital cost
- High operating costs
- Coverage gaps



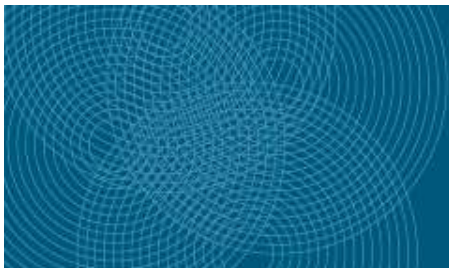
## Automatic Dependant Surveillance – Broadcast

### Characteristics;

- Relies on GPS for position
- Low capital cost
- Low operating costs
- Comprehensive coverage



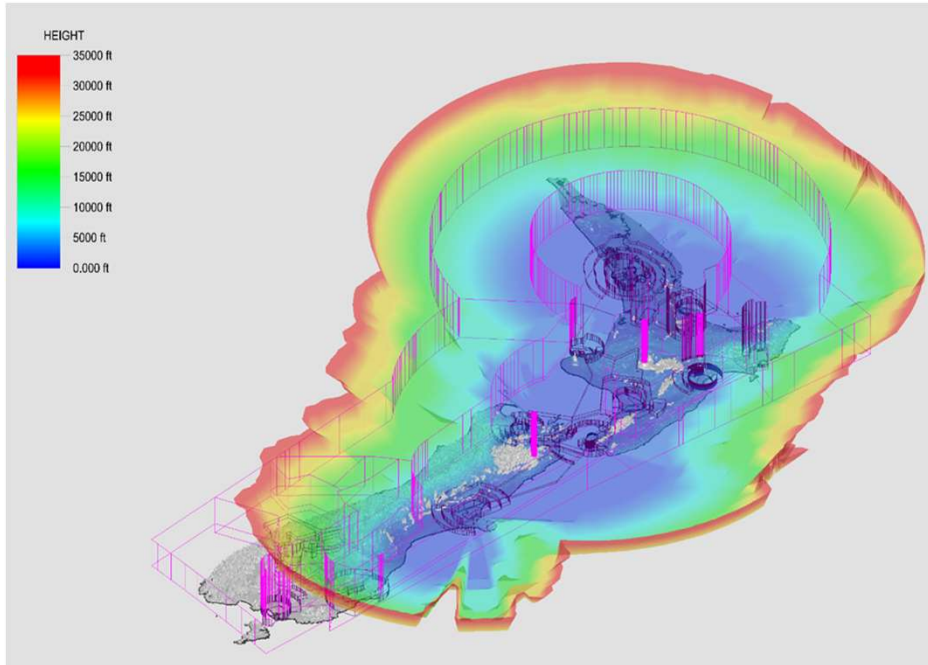
## *Future Operational Environment*



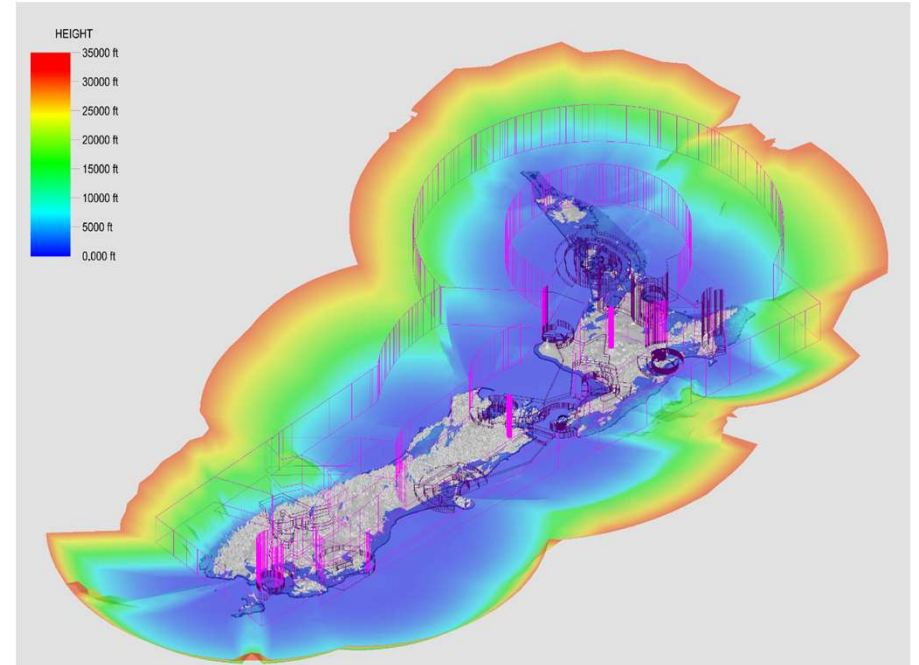
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sky



# ***RADAR to ADS-B***



Existing Radar Coverage (3D)



ADS-B Coverage  
(3D)

Note: Grey area is surveillance down to ground



# *System resilience*

- ADS-B relies on GPS
- GPS is very reliable but will become a common point of failure for both Navigation and Surveillance systems
- Proposed mitigation is a contingency surveillance network
- **The contingency network will be a backup, not an comprehensive alternative to ADS-B**





## ***Next steps for Airways***

- Commissioning of ADS-B ground stations: Phase 1: Feb 2018, Phase 2 FY19 - 20
- Potential trial of LPAT equipment (lower cost transponders)
- Initiate procurement process for contingency surveillance systems: Dec 2017 – Mar 2018
- Determine Non-cooperative systems requirements: Feb/ Mar 2018

# *Timetable for ADS-B regulations*



Now

- Current rules and advisory circulars



End 2018

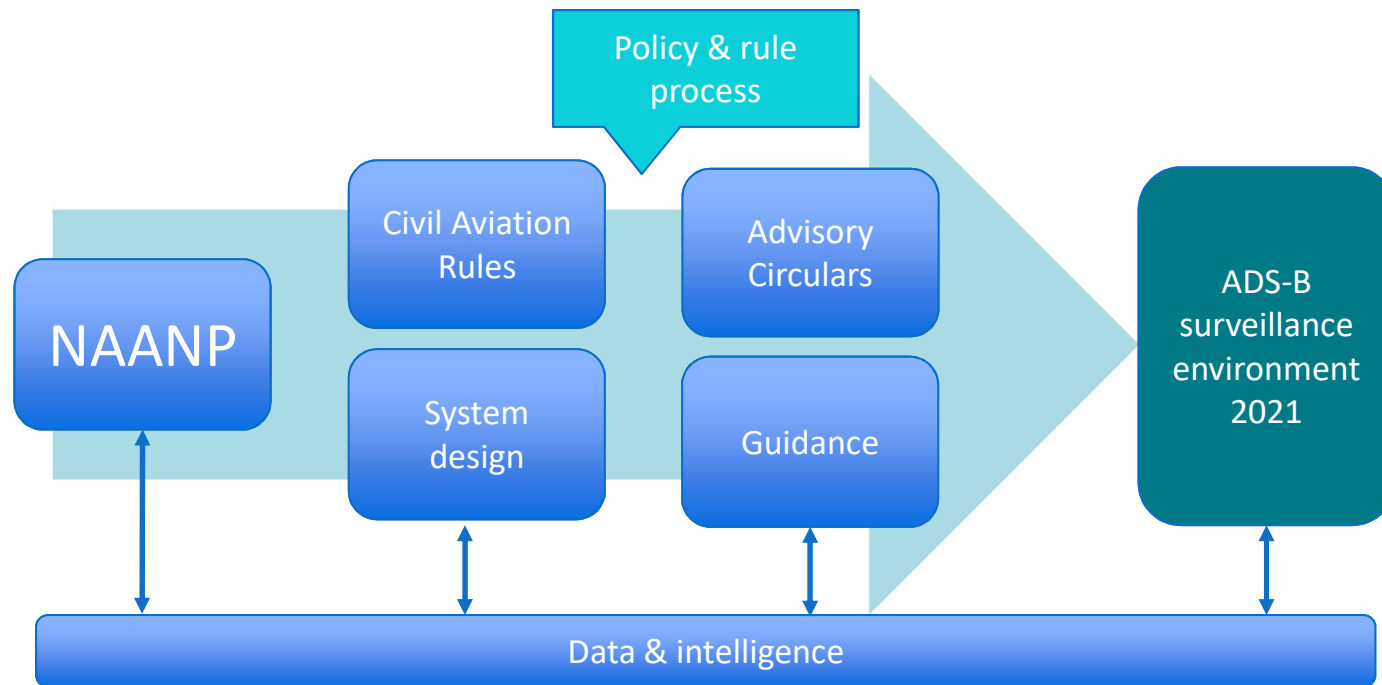
- ADS-B OUT mandatory in controlled airspace above flight level 245



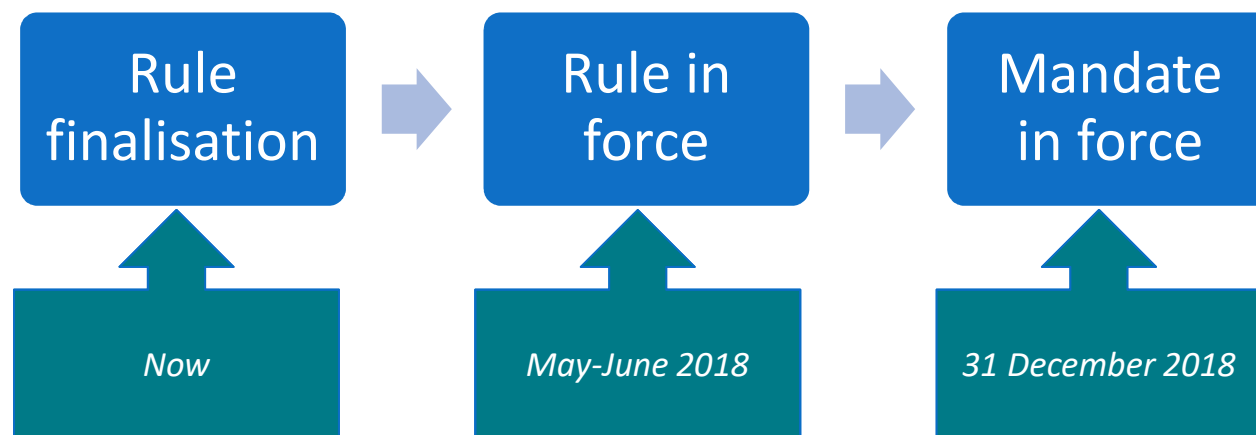
End 2021

- ADS-B OUT all controlled airspace

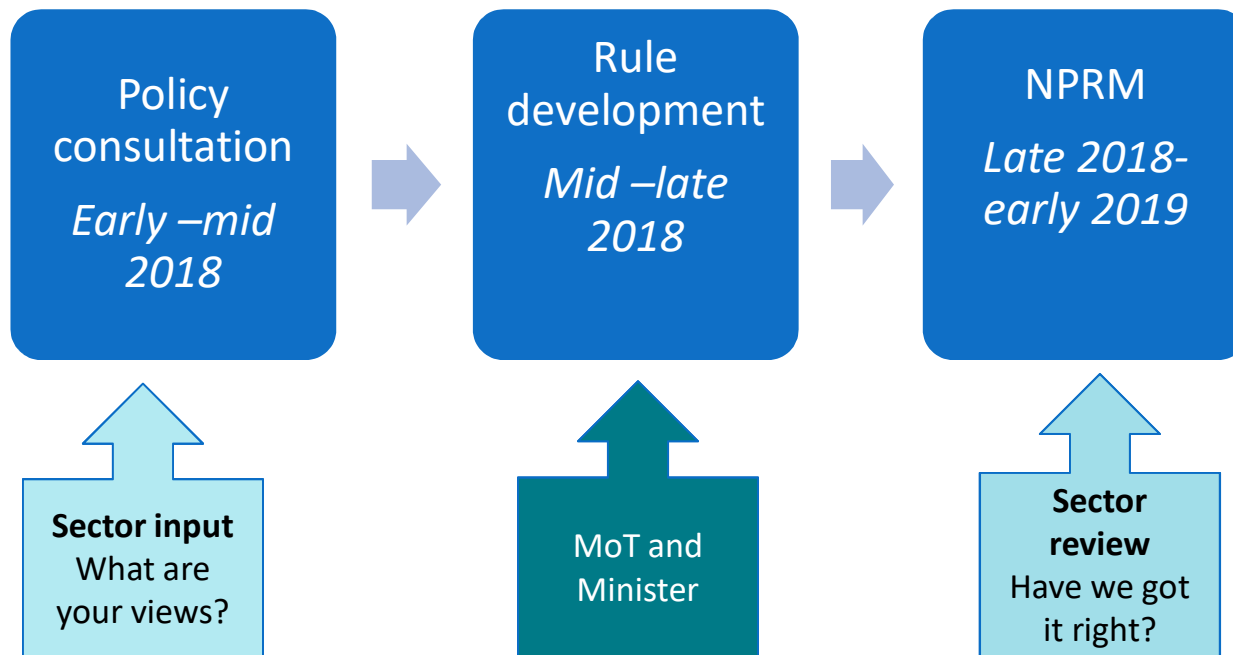
# *The pathway to new surveillance rules & guidance*



## *ADS-B above flight level 245*



## *Process below flight level 245*



## *Policy considerations*



Cost of and access to equipment



Engineering capacity



Certification processes



Education and training



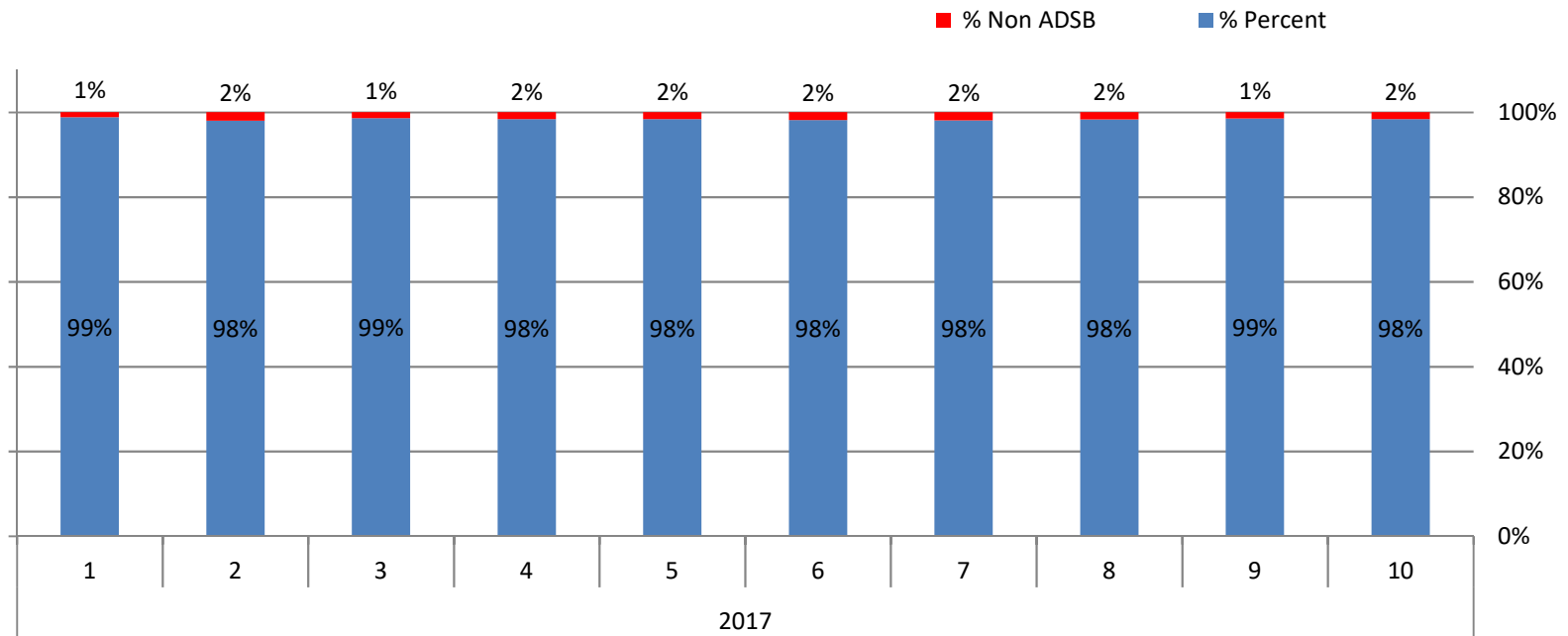
Monitoring ADS-B uptake



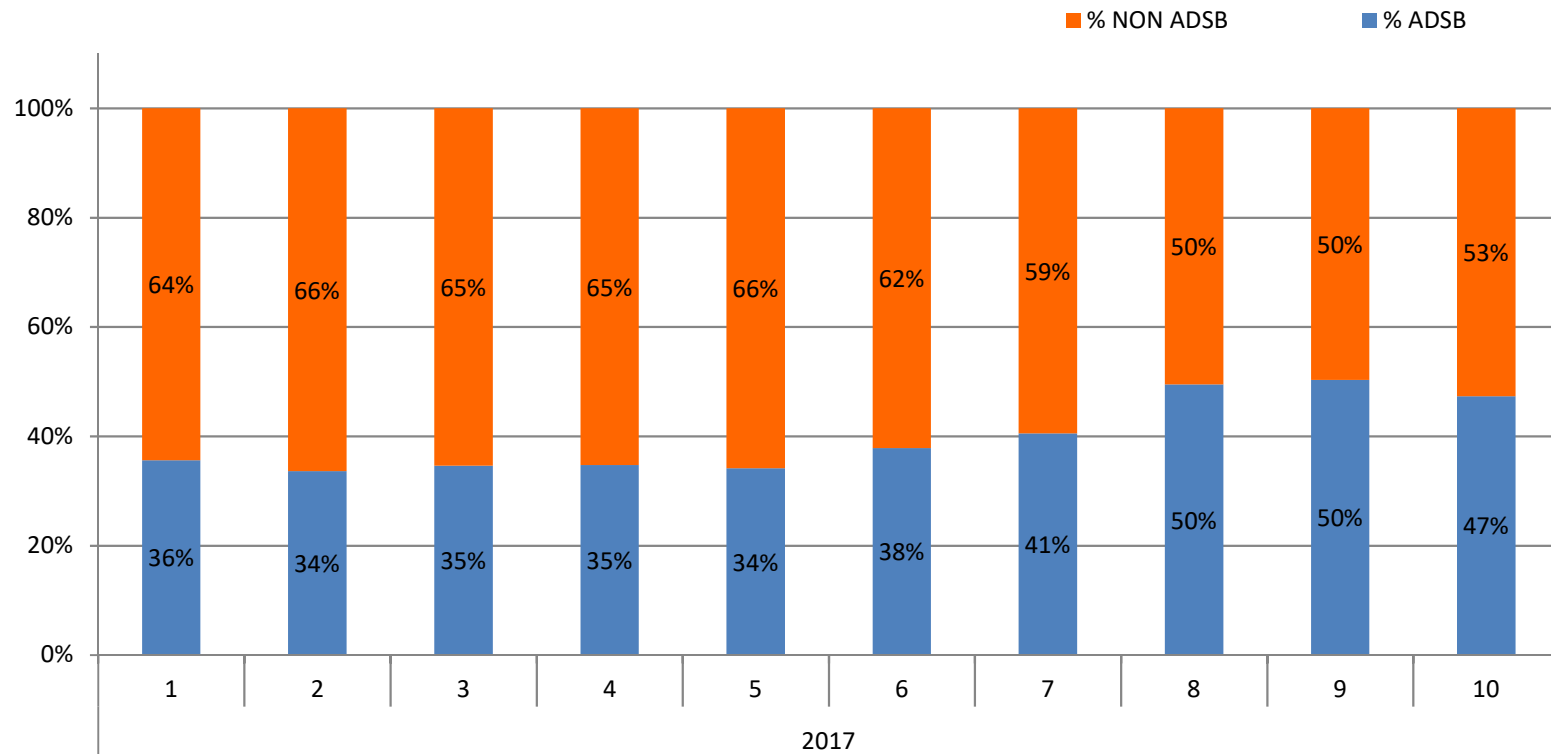
Global standards and interoperability



## *Flights above flight level 245 with ADS-B enabled*



## *Flights below flight level 245 with ADS-B enabled*



# Performance Based Navigation

NZ Operations

Equipage

PBN Regulatory Framework

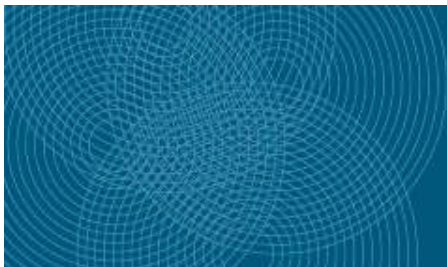
Ray Harvey, Manager Aerospace Programmes Unit, CAA

## *Foundations of operational planning PBN*

- PBN Implementation Plan 2009 (new publication due Dec 2017)
- National Air Space and Air Navigation Plan
- NSS Concept of Operations

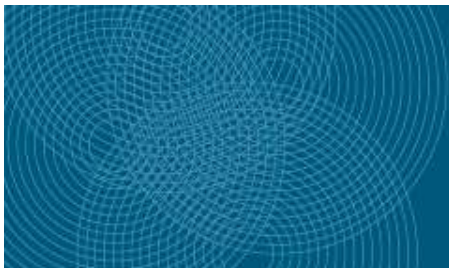


All three documents are available on the CAA or NSS websites, and quick links will be in the FAQ's for this roadshow as well.



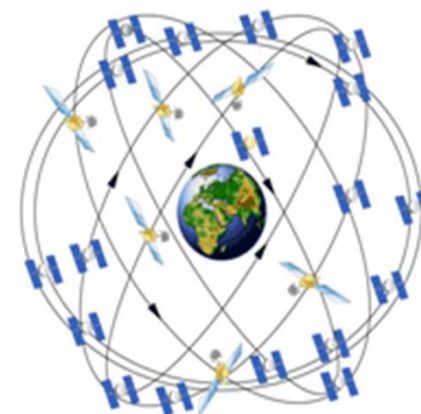
# ***PBN New Zealand Operations***

- **ICAO PBN Specifications Deployed**
  - RNAV 2, RNAV 1, RNP1, RNP APCH (RNAV (GNSS) RWY XX), RNP4, RNP10
  - RNP AR (authorisation required)
- **ICAO PBN Specifications – Future**
  - RNP 2, RNP 0.3(H), A-RNP



# ***PBN New Zealand Operations***

- **PBN Infrastructure (Domestic) based upon GNSS**
  - GPS Constellation
  - Future capability
    - multi-frequency, multi-constellation
    - Satellite Based Augmentation System (SBAS)
- **GNSS Vulnerability**
  - Aircraft Failure, Jamming, Spoofing, Space Weather, State Ownership
- **Alternate Navigation System**
  - ICAO PBN Requirement
  - NZ addressing GNSS Vulnerability
  - Solution: Ground Based Conventional Navigation Infrastructure



# ***PBN New Zealand Operations***

- **Upon Loss of PBN (GNSS)**
  - Extraction procedures
  - Recovery based upon conventional navigation
- **Ground Based Navigation Infrastructure Strategy**
  - Minimum Operational Network (MON)
    - VOR/DME Network Recommended (proposed)
  - Contingency Network
    - VOR/DME Network Recommended (proposed)
  - National Security and Resilience Considerations
    - [GBNA Strategy is available on www.nss.govt.nz](http://www.nss.govt.nz)





# *Navigation Equipment Standards:*

- PBN : GNSS, GPS constellation
  - TSO-C129(a)
  - TSO-C145/146
  - TSO-C196
- Recovery and Contingency
  - VOR: TSO-C38()
  - DME: TSO-C66()
- 129 specification does not have FDE, unless a specific LOA has been issued by the manufacturer. It is recommended that FDE capability is available to support operations outside of GBNA coverage. This will be assessed through the PBN Regulatory Framework Project
- DME/DME and inertial will be considered for contingency

# ***Transport Aircraft***

## ***(Subject to Safety & Policy review):***

- PBN Capability (NZ Domestic)
  - 2 x Independent GNSS (GPS) – Primary Means
  - 1 x Conventional System (Recovery)
    - VOR/DME (proposed)

Specific to PBN operations and recovery by conventional means.

If operating conventional as primary means then dual independent conventional systems are required.

Contingency System is being developed to address ongoing transport operations as well as national security and resilience requirements.

# ***General Aviation Aircraft***

***(Subject to Safety & Policy review)***

## PBN Capability (NZ Domestic)

- 1 x GNSS (GPS) – Primary Means
- 1 x Conventional System (Recovery)
  - VOR/DME (proposed, subject to further evaluation)

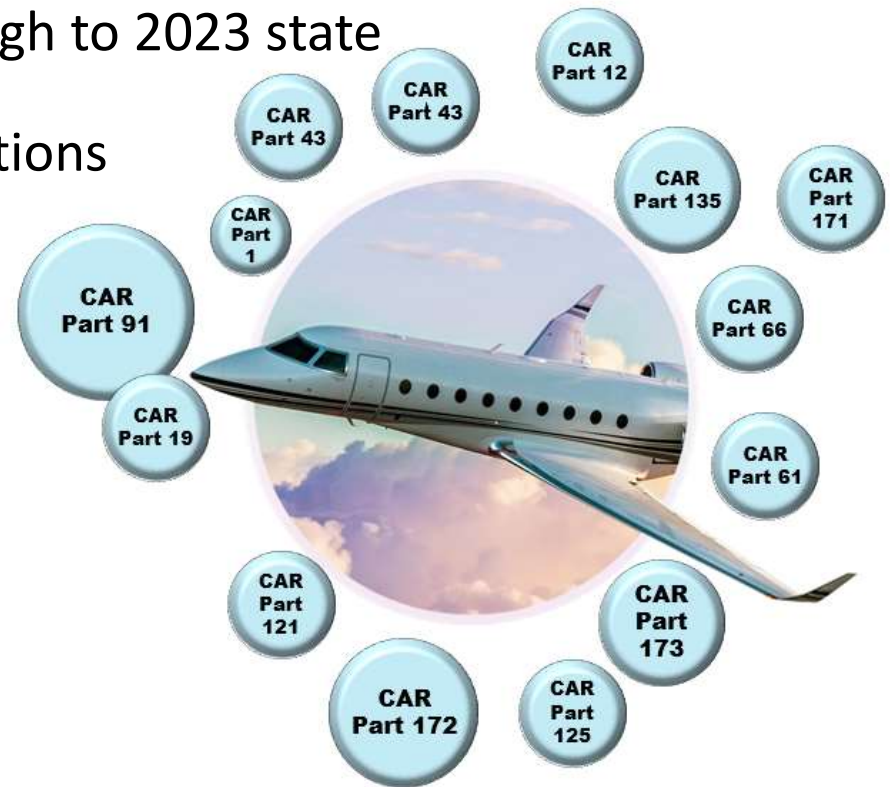
Specific to PBN operations and recovery by conventional means.



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— sky —

# *PBN Regulatory Framework*

- CAA Project to deliver regulatory change to enable PBN
- Focusing on current operations through to 2023 state
- Introducing new Navigation Specifications
- Considering
  - Technology
  - NZ Infrastructure
  - Operations



# ***PBN Regulatory Framework cont.***

## **Project Approach**

- Phased (based upon engagement outcomes)

## **Project Deliverables:**

- Revision to Rules
- Revision to AC's
- Guidance

## **Stakeholder Engagement**

- NSS Working Group (5 Dec 17)
- Sector Engagement
  - PBN Regulatory Roadshow (Feb/Mar 18)
  - Policy and Rule development







# ***NSS Technical Requirements Clayton Hughes***

***Manager SFORA, CAA***

# ***Design Change***

Acceptable Technical Data



# *Design Change*

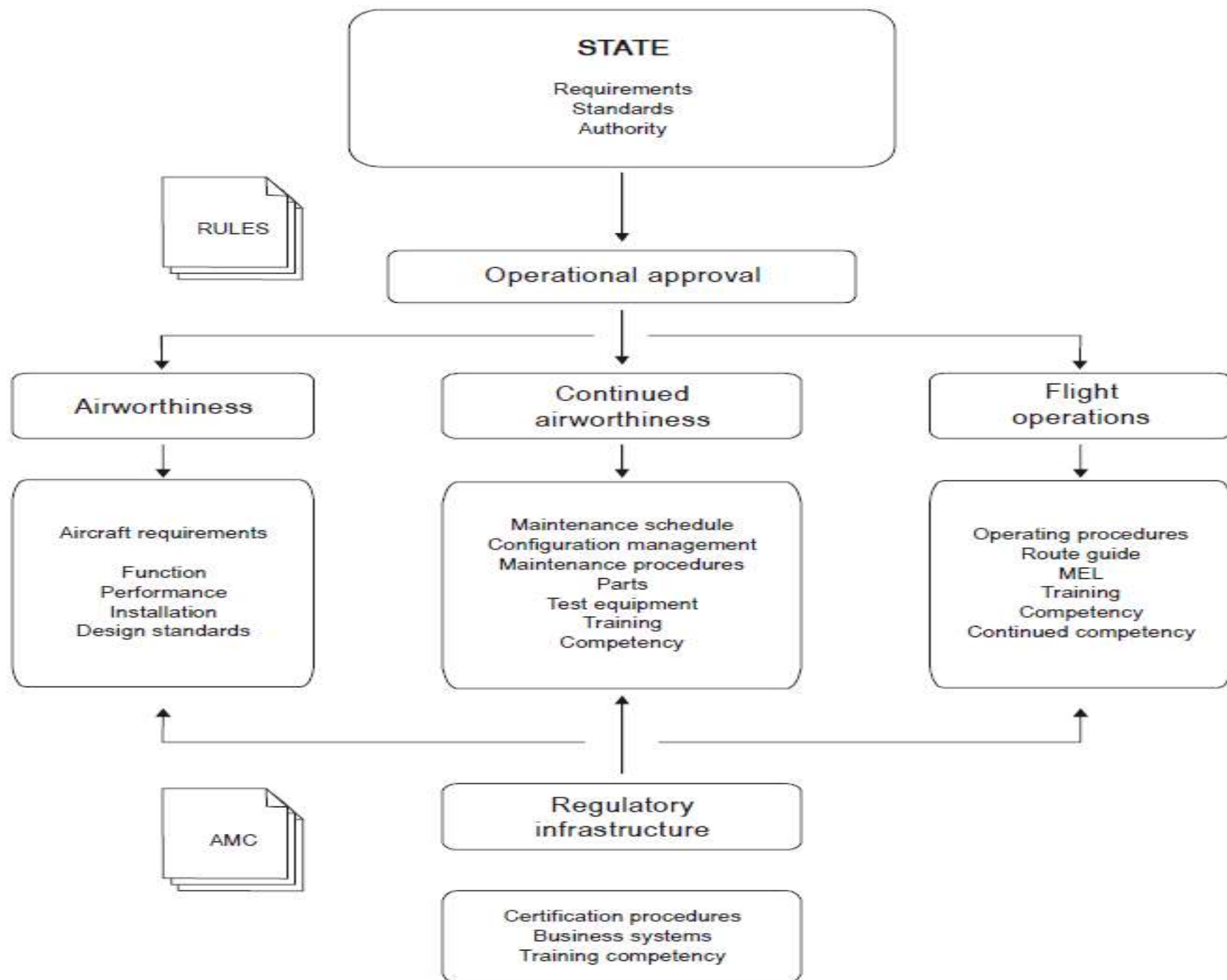
- Installation of Modern Systems
- Design Change therefore Acceptable Technical Data Is Required
- IAW Part 21 Appendix D
  - STC – OEM
  - STC – Design Organisation – Part 146
    - Including Flight Testing
    - Installed Performance

***PBN***

## Equipment and Approval

# *Equipment (Proposed)*

- Current Rules are open to interpretation and do not provide guidance on what is required.
- However Intent will be to describe actual numbers of boxes etc, based on NZ requirements.
  - i.e CAR XX.353 may say  
2 GPS and 1 VOR; 1 DME proposed subject to further evaluation.  
Part 91 – 1 GPS 1 VOR 1 DME proposed subject to further evaluation.



# ***ADS-B***

## Equipment and Approval

# *ADS-B Ins and Outs*

- ADS-B Out – Mandated (Proposed)



- ADS-B In – Not Mandated, but recommended



# *ADS-B for GPS – Internal vs External*

- ADS-B Out – Separate TXPDR and GNSS



- ADS-B Out – Internal GPS





# ***ADS-B Approval Proposed in Draft Rule***

- Equipment - TSO-166(b) – TSO 145 & 146  
Non Certified Equipment – TBC
- Approval – if STC'd with ATD and TSO'd equipment no further approval required
- Must be tested with appropriate test equipment  
test results sent to CAA

# ADS-B Installations

