Part 19 D IFR Operations: GNSS

Review of rules related to GNSS operations within the New Zealand domestic FIR

Discussion Document
February 2016
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1. Executive Summary

The Civil Aviation Authority (CAA) created Rule Part 19D to regulate the use of Global Positioning Satellites (GPS) for navigation in 1997. These rules are now out of date and are no longer appropriate given changes in Global Navigation Satellite System\(^1\) (GNSS) technology and the move towards performance based navigation (PBN).

The purpose of the document is to seek your feedback on whether we have canvassed all the issues relevant to updating GNSS rules in New Zealand. The issues are grouped into four broad themes:

- **means of navigation** – the use of GNSS for aircraft navigation, including its use alone or in conjunction with other means of instrument navigation; the use of GPS to derive distance information
- **aircraft equipage** – the equipment required for GNSS navigation
- **flight operations** – minimum flight altitudes, alternate aerodromes, flight plans, flight on unevaluated routes
- **pilot/crew qualifications** – competency in the use of GPS for navigation and instrument approach procedures.

Each of these issues comes with unique as well as overlapping considerations. We have begun the analysis on the consequences of each issue, and we invite you to submit your feedback on the analysis and whether or not we have fully considered all of the issues involved. The questions are a guide. We welcome any other comments you wish to make about Part 19D and GNSS Instrument Flight Rules navigation and the transition to PBN navigation.

The CAA will consider and analyse all submissions received in response to this document. That information will feed directly into any changes to rules and/or guidance on GNSS IFR operations in New Zealand.

The CAA will then prepare a draft rule or set of rules, which we expect to be formalised in late 2016. Consultation on the draft rule will be done using the Notice of Proposed Rule Making (NPRM) process.

\(^{1}\) The generic term for these navigation technologies, of which GPS is now one of several.
2. Providing your feedback

*Responding in writing*

You can provide written feedback on the electronic feedback form (that collates the questions in this document) at [http://www.caa.govt.nz/nss/index.htm](http://www.caa.govt.nz/nss/index.htm)

If you wish to use another format, please clearly indicate which question you are responding to.

E-mail: docket@caa.govt.nz  *please use “IFR GNSS” in the subject line*

Post: Jonathan Barron  
Senior Policy Advisor  
Civil Aviation Authority  
PO Box 3555  
Wellington  6140

Written feedback on the issues and options presented must be provided to the CAA by close of business on Friday 18 March, 2016.

*Responding in person*

We will, where possible, accommodate requests to meet with you to discuss this review and receive your feedback in person or by teleconference. To arrange a meeting, please contact us at the above address with your preferred time and place.

*More information*

You can find more information on New Southern Sky at [www.nss.govt.nz](http://www.nss.govt.nz).

*The Official Information Act 1982*

Please note that, once received, submissions become public information that can be requested under the Official Information Act 1982. Please indicate clearly if any parts of your comments are commercially sensitive, or if for any other reason you would not want them disclosed.

*Meetings to discuss the proposals in this document*

The CAA may be able to arrange to meet with you to discuss the proposals in this document. If you wish to request a meeting, please contact Jonathan Barron (contact details above). If at all possible, please submit a meeting request by Tuesday, 1 March 2016.
## 3. Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
<td>Automatic direction finding – an electronic aid to navigation that identifies the relative bearing of an aircraft from a radio beacon transmitting in the MF or FL bandwidth.</td>
</tr>
<tr>
<td>ADS-B</td>
<td>Automatic Dependent Surveillance – Broadcast, a ground based system using GNSS derived position information.</td>
</tr>
<tr>
<td>ATPL</td>
<td>Airline transport pilot’s licence</td>
</tr>
<tr>
<td>CPL</td>
<td>Commercial pilot’s licence</td>
</tr>
<tr>
<td>DME</td>
<td>Distance measuring equipment, a ground-based navigation aid</td>
</tr>
<tr>
<td>DR</td>
<td>Dead reckoning</td>
</tr>
<tr>
<td>FD</td>
<td>Fault detection – a GNSS receiver capability that enables the receiver to determine that it is receiving compromised data from one or more satellites. FD receivers will cease to provide navigation information in this circumstance.</td>
</tr>
<tr>
<td>FDE</td>
<td>Fault detection and exclusion – a GNSS receiver capability that enables the receiver to identify and exclude compromised data from one or more satellites. The receiver can continue to provide navigation information in that circumstance, providing that there is sufficient satellite availability.</td>
</tr>
<tr>
<td>FIR</td>
<td>Flight Information Region – a designated area of airspace</td>
</tr>
<tr>
<td>FMS</td>
<td>Flight management system – an on-board multi-purpose navigation, performance, and aircraft operations computer designed to provide virtual data and operational harmony between closed and open elements associated with a flight from pre-engine start and take-off, to landing and engine shut-down.</td>
</tr>
<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System, the US owned constellation that is one example of GNSS</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IFR</td>
<td>Instrument Flight Rules</td>
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<tr>
<td>ILS</td>
<td>Instrument landing system</td>
</tr>
<tr>
<td>MSA</td>
<td>Minimum safe altitude</td>
</tr>
<tr>
<td>NDB</td>
<td>Non-directional beacon, a ground-based navigation aid</td>
</tr>
<tr>
<td>PBN</td>
<td>Performance based navigation</td>
</tr>
<tr>
<td>PPL</td>
<td>Private pilot’s licence</td>
</tr>
<tr>
<td>RAIM</td>
<td>Receiver Autonomous Integrity Monitoring – a system to assess the integrity of a GNSS derived position. RAIM detects faults or availability issues with the GNSS signal.</td>
</tr>
<tr>
<td>RNAV</td>
<td>Area navigation – instrument navigation that does not require on-board alerting or notification of the crew</td>
</tr>
<tr>
<td>RNP</td>
<td>Required navigation performance – instrument navigation using lateral navigation with on board performance and alerting.</td>
</tr>
<tr>
<td>RNP-AR</td>
<td>Required navigation performance – authorisation required. RNP approaches that can only be flown with the authorisation of the Director of Civil Aviation. This includes BARO VNAV and inertial navigation in support of RNP guidance, as well as other systems.</td>
</tr>
<tr>
<td>VFR</td>
<td>Visual Flight Rules</td>
</tr>
<tr>
<td>VOR</td>
<td>VHF omnidirectional radio range, a ground-based navigation aid</td>
</tr>
</tbody>
</table>

The document uses the terms GPS and GNSS throughout. GPS is used to describe the current status quo in Part 19D, whereas GNSS is used to describe the technologies more broadly.
4. Introduction

Purpose of this document
The purpose of this document is to outline and seek your feedback on the issues with the current Global Satellite Navigation System (GNSS) Instrument Flight Rules (IFR) rules. It is the first stage in the policy and rule development process.

Structure of this document
The high level issues identified with Part 19D can be grouped into four general themes:

- **means of navigation** – the use of GNSS for aircraft navigation, including its use alone or in conjunction with other means of instrument navigation; the use of GPS to derive distance information
- **aircraft equipage** – the equipment required for GNSS navigation
- **flight operations** – minimum flight altitudes, alternate aerodromes, flight plans, flight on unevaluated routes
- **pilot/crew qualifications** – competency in the use of GPS for navigation and instrument approach procedures

Each section will describe the issues faced and invite comment on the analysis.

The appendices at the end summarise the questions posed.

Next steps in the process
Please note that this is a discussion document, designed to assist CAA in the rule development process.

The CAA will consider and analyse all submissions received in response to this document. That information will feed directly into the development of proposed changes to existing rules and/or the development of a new rule to cover GNSS IFR operations in New Zealand.

The CAA will then prepare a draft rule or set of rules, which we expect to be formalised in late 2016. Consultation on the draft rule will be done using the Notice of Proposed Rule Making (NPRM) process. You can sign up at http://notifications.caa.govt.nz/ to be notified of the NPRM consultation document. The CAA will send notice to everyone who makes a submission and/or attends a meeting on this discussion document.

Submissions on the NPRM will be used to inform the development of a proposed final rule.

The revised Advisory Circular (AC91-21) as well as any other consequential changes to related ACs will also be released for consultation before being finalised.

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5. Background

Transitional Rule Part 19 D and the use of GNSS

Transition Rule Part 19 Subpart D – IFR operations: GNSS was issued by the Minister of Transport in 1997 to regulate the use of Global Positioning System (GPS) for air navigation in New Zealand.

There have been significant technological advances since 1997 which significantly improve continuity and integrity.

In 1997, the US-owned GPS was the only constellation capable of providing navigation information for safety critical services including aviation. While GNSS receivers for aviation currently rely on GPS only, standards for multi-constellation receivers are being developed, although the exact timeframes are still unclear. At present the availability and the coverage of each constellation varies, but it is the CAA’s assumption that more satellite constellations will become available for use in air navigation in the future, and the civil aviation rules (CARs) need to provide for this.

These, among other reasons, are a strong indicator of the need for the CARs to be future-proofed, to make the most efficient and safest use of emerging technological options.

The known benefits of GNSS navigation include:

- improved accuracy of position when navigating under IFR
- better coverage than conventional navigation aids
- greater reliability: GNSS is a more reliable means of navigation than ground based navigation aids.

The transitional rules outlined in CAR Part 19D are no longer fit for purpose as they are both out of date and unable to facilitate the benefits of GNSS navigation to New Zealand.

Performance based navigation (PBN)

GNSS has had a major impact on aircraft navigation especially through the introduction of performance-based navigation (PBN). PBN allows pilots to fly flexible routes, as the route is less constrained by navigation aid placement and range. Approaches and departures using PBN are also more accurate, direct, and efficient.

The precision enabled by PBN improves safety throughout all phases of flight, as there is a greater degree of certainty for both crew and air traffic control as to the exact location of the aircraft.

The International Civil Aviation Organization’s (ICAO) PBN Manual (Doc 9613) describes the recommended approach to PBN worldwide. New Zealand has begun implementing PBN, and one of the goals of the New Southern Sky programme is to ensure that PBN operations in the domestic FIR are consistent with the intent of the ICAO PBN plan.  

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3 New Southern Sky is the programme being undertaken to modernise New Zealand’s aviation system and is being led by the CAA.
The NSS objectives for navigation establish the expectation that PBN will become the normal means by which aircraft operators navigate under IFR.
6. Means of navigation

CAR 19D differentiates between three means of using GNSS for navigation. This section includes focuses on the following parts of the current CAR 19D:

- Primary means GPS operations (CAR 19.207)
- Sole means GPS operations (CAR 19.209)
- Supplemental means GPS operations (CAR 19.211)

CAR 19.207 – Primary means GPS operations

Key points:

- Aircraft equipage requirements may need to change with any change to GNSS
- Receiver Autonomous Integrity Monitoring (RAIM) prediction requirements, including times will need to be reconsidered in light of other states’ policies
- Requirements for alternate aerodromes requirements are likely to be affected by any decision on sole means

CAR 19.201 defines primary means GPS operations as:

A navigation system approved for a given operation or phase of flight that must meet accuracy and integrity requirements, but need not meet full availability and continuity of service requirements. Safety is achieved by limiting flights to specific time periods, and through appropriate procedural restrictions.

The CAA can approve a navigation system as primary means, so long as it meets the requirements. If the primary means is GPS, it can then be used as per 19.207.

Aircraft equipage

There are several out of date aircraft equipage requirements. Part 19.207 Primary means GPS operations requires that:

Each person operating an aircraft under IFR using GPS equipment as a primary means navigation system shall—

1) ensure that—

   i. the GPS equipment is approved to Level 1 on form CAA 2129; and
   
   ii. the aircraft’s form CAA 2129 has been endorsed, approving the GPS equipment for use on the intended IFR operation as a primary means navigation system.

CAA form 2129 requires that for IFR operations all equipment must be level 1, and the level 1 equipment listed in AC 43-10 is all Technical Standard Order (TSO) 129. This TSO is
no longer supported by the Federal Aviation Authority (FAA), having been superseded by TSO-C145 and 146 receivers which offer fault detection and exclusion (FDE).  

The specification of TSOs effectively mandates their use; however the reference to CAA Form 2129 and its subsequent requirement for use of level 1 equipment is now out-of-date. CAA approves more recent GNSS receivers for IFR use because their performance is superior to TSO-C129 and provides a greater level of safety.

Q1. Do you agree that this is an accurate description of the current problem with equipment specifications in CAR 19.207? If not, why not?

Q2. Are you aware of any other issues related to these equipage requirements? If so, please provide details.

There is further discussion of aircraft equipage requirements later in the document.

RAIM prediction

RAIM is a function developed to assess the integrity of GNSS derived positions in a GNSS receiver system. As the location, paths, and scheduled outages of each GNSS satellite are published, RAIM prediction systems are able to calculate and identify geographical areas that may not have sufficient GNSS coverage in advance, i.e. pre-flight.

In New Zealand, RAIM prediction is available through Airways New Zealand. Some airlines use alternative RAIM service, as the Rule does not specify which service(s) can or must be used, and does not set any required performance parameters or criteria for RAIM prediction services.

There are three main issues with the current requirements for RAIM prediction as set out in CAR 19D:

- The requirement for RAIM prediction only on pre-departure and for specified approach only phases of flight;
- The length of time for which a RAIM warning is acceptable before the pilot must advise air traffic control (ATC) and revert to another means of navigation (i.e. a VOR or NDB); and
- The applicability of the current Rules with regard to CAR 121 and 125 aircraft with flight management system (FMS) capability.

RAIM prediction and phases of flight

4 Most TSO-C129 equipment is fault detection only, although airlines can have this TSO with FDE by special letter of authorisation.

5 The consequential effects of changes to 19D will be fully scoped as part of the next stage of policy development.
ICAO recommends that RAIM predictions are carried out for all phases of flight (en-route, terminal, and approach) when conducting GNSS IFR operations in a non-WAAS environment\(^6\). AC 91-21 also states this.

However, the rule requires RAIM predictions for approach procedures at present.

**RAIM warning**

CAR 19.207(7) discusses RAIM warnings in the en-route phase, which occur when the on-board system detects loss of the integrity required to provide an aviation navigation solution. At present, pilots must contact ATC if they have a RAIM warning that lasts more than ten minutes, or more than one minute of dead reckoning (DR), after the GPS equipment has stopped providing a navigation solution.

CAR 19.213 – GPS derived distance information – applies the same ten minute warning window.

Most other jurisdictions require reversionary procedures after a RAIM warning has been displayed for more than five minutes. The lesser time requirement would give a greater level of certainty about the accuracy of the position of the aircraft based on GPS-derived information during or following a RAIM warning; however may increase pilot and ATC workload.

Regardless of the safety decision on the acceptable time period, the CARs and advisory circulars (ACs) need to provide consistent requirements and advice to operators.

**RAIM and Flight Management Systems (FMS)**

The current rules do not differentiate between aircraft fitted with FMS and those with stand-alone GPS receivers. There may be an argument that the ability of an FMS to provide a navigation solution using other sensors means that those aircraft should not have the same requirement for RAIM prediction within the domestic FIR.

CAA is considering developing and implementing performance parameters for RAIM prediction services, particularly to support a PBN environment.

**Q3.** Do you agree that this is an accurate description of the current RAIM prediction services and requirements? If not, why not? Please provide details of any additional issues, or clarification of those listed above.

**Q4.** Do you know of any specific issues relating to RAIM outages in New Zealand?

**Q5.** If you need RAIM prediction for your operation, what service(s) do you use? Do you have any observations about the quality of the service(s)?

**Q6.** If the requirements for RAIM prediction were strengthened, for example a five minute RAIM warning and/or a requirement for RAIM prediction prior

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\(^6\) WAAS, or Wide Area Augmentation System, is an SBAS (satellite-based augmentation system) which provides corrections to make GPS signals more accurate. The US has WAAS/SBAS coverage.
to departure and en-route, what impact would this have on your operations? Please consider both positive and negative impacts.

Q7. Do you believe that there should be different requirements for integrity monitoring for aircraft with FMS and those with standalone GNSS receivers? Why, or why not?

Q8. Do you support performance requirements for RAIM prediction services? Why, or why not?

Alternate aerodromes

CAR 91.405 - IFR alternate aerodrome requirement – provides that aircraft being flown IFR must list at least one alternate aerodrome unless certain other conditions are met.

CAR 19.207(9) provides additional requirements to CAR 91.405, insofar as the alternate must have an operational ground-based navigation aid with an instrument approach procedure based on other than GPS navigation; and the aircraft has the equipment on board to use that radio navigation aid (i.e. a VHF omnidirectional radio range (VOR) or automatic direction finding (ADF) receiver).

Q9. Do you have any comment related to either satisfying the conditions under 91.405 OR identifying an aerodrome that meets the requirements of 19.207(9)?
CAR 19.209: Sole means GNSS operations

Key points:

- IFR using GPS as the only available source of navigation information is currently prohibited under CAR 19.209(a).

- Limited use of GPS primary means is currently allowed under General Rule Exemption 11/EXE/7. CAA will review the exemption as part of this policy process.

CAR 19.201 defines a sole means navigation system as:

A navigation system approved for a given operation or phase of flight that must allow the aircraft to meet, for that operation or phase of flight, all four navigation system performance requirements: accuracy, integrity, availability, and continuity of service.

Current rule overview

At present, CAA approves IFR using conventional navigation (e.g. ground-based navigation aids) as sole means. CAR19.209 (a) prohibits the use of a sole means system which uses only GPS sensors within the New Zealand FIR.

In effect, this means that even if the CAA approved a GPS only navigation system after being satisfied that it meets all four performance requirements, that system could not be used as the sole navigation system.

Sole system

CAA is not proposing to have GNSS as the only source of instrument navigation data, known as sole system. A sole system would see all ground-based navigation aids removed. This state could also be achieved by removing the requirement for aircraft to carry equipment to receive VHF omnidirectional radio range (VOR) or non-directional beacon (NDB) equipment. This would effectively remove the option of reverting to conventional navigation if the aircraft lost GNSS signal.

Airways has stated that it will retain a VOR at every controlled aerodrome, and an ILS system at all international airports, where the terrain allows. This is because New Zealand does not have complete coverage from ground-based navigation aids. There are areas enroute, and some aerodromes, that have published GNSS procedures without an underlying navigation aid.

There are benefits to allowing GNSS only navigation in certain circumstances, where safety can be achieved through, but not limited to, equipment standards, appropriate flight planning and procedures, appropriate obstacle clearances and surveillance.

Currently CAR 19.209 prohibits GPS sole means navigation; however under exemption 11/EXE/7, operators may operate using GPS sole means operations (primary means with conditions equivalent to sole means for all intents and purposes) only provided they meet certain requirements. It is a general exemption and therefore operators do not need to specifically apply for approval to use it.
The exemption makes it possible for operators to fly the scenarios in figures 1 and 2 today.

**Figure 1:** en-route GNSS sole means\(^7\), for example Wellington to Hamilton with the ability to revert to VOR at Palmerston North in the event of loss of GNSS navigation

**Figure 2:** GNSS sole means\(^8\) to an aerodrome without a navigation aid, for example Dunedin to Wanaka with Westport as an alternate in the event of loss of GNSS navigation

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\(^7\) Primary means with conditions equivalent to sole means for all intents and purposes.

\(^8\) Primary means with conditions equivalent to sole means for all intents and purposes.
Q10. Do you fly IFR sectors using only GPS now?
Q11. If so, what do you perceive as the benefits of the current approach?
Q12. What do you perceive to be the risks of the current approach?
Q13. Do you have any other comments regarding the current system?
Q14. What issues do you foresee regarding requirements for a non-GNSS alternate aerodrome in a limited sole means environment? What would be the costs, benefits, and/or risks?
CAR 19.211: Supplemental means GNSS operations

Key points:

- Any GPS receiver that is not certified to at least TSO-C129 can only be used to provide supplemental information.
- Supplemental information can assist pilots when used in conjunction with a sole means system (i.e. conventional IFR navigation).
- CAA proposes to retain the category of supplemental navigation as it provides a clear differentiation between equipment that can and cannot be used for navigation, but does not preclude the use of additional equipment.
- The definition of supplemental means will need to be updated to reflect current GNSS receiver performance standards and to be able to accommodate future advances. PBN cannot be achieved through supplemental means.

A supplemental means navigation system is defined in CAR 19.201 as:

\[
\text{A navigation system that must be used in conjunction with a sole means navigation system.}
\]

Current rule

CAR 19.211 provides that if the GPS receiver is not approved to Level 1 requirements on the CAA 2129 form (i.e. is not at least a TSO-C129), then it can only be used to provide supplementary information.

Any GPS receiver can be used to provide supplemental position information. It does not need to be approved. Anecdotal reports from operators indicate that they use portable electronic devices (sometimes known as electronic flight bags) as supplemental means, providing information in addition to their main system, be that GPS or conventional navigation aids.

Q15. Is this your understanding of supplemental means?

Q16. Do you currently use a form of supplemental means for GPS operations?

Q17. If so, what equipment do you use? What benefits are there to using supplemental means?

Q18. What risks do you see with the use of supplemental means?

Issues

It is important to differentiate between equipment that can be used for primary means of navigation, and that which can usefully provide supplemental information but which cannot provide an aviation-standard navigation solution.

By setting standards for primary and sole means GPS receivers, the Rules define anything with lower performance as for supplemental use only. However, CAR 19.211 currently requires, through reference to CAR 19.207(1), that all GPS receivers used for IFR must be certified to TSO-C129.
There are no specified performance requirements in the current rule for supplemental means of navigation. This provides for flexibility with regard to what pilots can use; however it may also introduce risk if:

- The information provided by the supplemental means differed substantially from the information provided by the sole means system, introducing doubt or distraction to the crew.
- Implies or introducing the potential for reliance on a supplemental means of navigation as a back-up to sole means for IFR use.
- Introduction of added complexity or distraction into the cockpit through use of portable electronic devices as supplemental means.

Although the issues around supplemental means are relatively minor, it is important that operators have clear advice on the purpose and use of supplemental means, and specifically the limitations of such equipment. Further information about the type of receiver used will help the CAA better understand what changes to the rule are most appropriate.

**Q19.** Do you agree that these are the main issues concerning supplemental means? If not, what other issues do you think should be considered?

There are two options that could be used to address the issues identified above.

**Option 1:** Continue to allow the use of supplemental means as status quo

**Option 2:** Apply performance requirements to GPS equipment to be used as supplemental means

**Q20.** Which of these options do you prefer? Why?

**Q21.** Are there any other options or actions that you would suggest regarding supplemental means? If so, please provide details.
7. Aircraft equipage for GNSS IFR operations

This section includes discussion of the following points:

- Current aircraft equipage requirements
- Number of GNSS units required
- Requirement to carry conventional navigation aid receivers
- Exemption 11/EXE/7
- Proposal: a minimum equipage level for GNSS IFR operations

Key points:

- AC43-10 was last revised in 2002 and is now out of date.
- The extensive use of an exemption, 11/EXE/7, means that there is variability in the equipment on aircraft.
- The GPS equipment on board IFR aircraft varies considerably.
- New Zealand has fallen far behind comparative countries.

Current aircraft equipage requirements

CAR 19D specifies that any person operating aircraft under IFR using GPS equipment as primary means of navigation system must meet the performance requirement and have the GPS equipment endorsed on CAA 2129 form. The equipment approval levels are specified in Appendix A of the Advisory Circular (AC43-10).

The equipage requirements specified in CAR 19.207(3) are:

i. for air transport operations, two operable sole means navigation systems other than GPS, appropriate for the route being flown.

ii. for non-transport operations, one operable sole means system other than GPS, appropriate for the route being flown.

The rationale for two operable sole means systems for transport operations is to provide redundancy in the event of loss of GPS receiver function, or loss or degradation of the signal itself, and recognising the duty of care that operators have when transporting members of the public.

GNSS equipment that does not meet Level 1 performance requirement can only be used to provide supplementary information.

Approval levels are prescribed in Appendix A of the Advisory Circular AC43-10. The levels are set by assessing the equipment’s ability to meet the minimum performance standards of the relevant technical specification. There are currently three main issues with aircraft equipage requirements:

- The AC and rule are out of sync with comparable nations and are now out of date;

- Exemption 11/EXE/7 creates variability in the level of equipment on aircraft; and
• The overall use of equipment varies in age and capability.

Level 1 performance requirement for navigation equipment were aligned with the following technical standards:

• Federal Aviation Administration TSO - C40, C41, C60, C94, and C129
• British Civil Aviation Publication (CAP) 208 Class WR, VC, or LA I
• Australian Airborne Radio Navigation Publication No. 50 (Pub 50) Class I

AC43-10 was last revised in 2002. Since the last revision, each of the above technical standards has been withdrawn.

The primary issue with aircraft equipage requirements for IFR GNSS operations is that the requirements are out of date, and inflexible. The prescriptive nature of the rule has not kept pace with technical developments.

The GPS equipment on board IFR aircraft also varies considerably in terms of its age, capability (e.g. FD versus FDE), and the number of units carried. Some variation is inevitable and is in fact necessary to accommodate different types of aircraft and operations. However, older or lower capability equipment may not meet the requirements of PBN and surveillance systems.

For example, Civil Aviation Safety Authority (CASA, Australia’s aviation regulatory body) has assessed that TSO-C129 GPS receivers are unlikely to meet ADS-B performance requirements, and are also unlikely to provide the performance required in a PBN environment, unless integrated into an FMS and augmented with inertial systems. 9

This information indicates that other countries that are also implementing newer systems are considering phasing out of older equipment to:

• Maximise the safety and efficiency benefits from more modern systems.

• Ensure that as many operators as possible have avionics equipment that can be used without special allowances.

This process recognises that system modernisation comes with a cost to operators, and that benefits should ideally balance those costs out over time.

Q22. Do you agree with this description of the issues with current GNSS IFR equipage requirements? If not, why not?

Q23. Are there any other issues that we should be considering? If so, please provide details of the costs, risks, or benefits that arise from those issues.

9 CASA Civil Aviation Order 20.18 (aircraft equipment – basic operational requirements) is available here: https://www.comlaw.gov.au/Details/F2012C00572
Q24. Do you agree that there should be a requirement for aircraft to be equipped with non-GPS navigation equipment requirements for primary means operations? Why, or why not?

Q25. Do you believe there should be any requirements specific to carriage of VOR/DME or ADF receivers? If so, why?

Q26. Do you think there should be different equipage requirements for different types of operators and operations, for example two receivers for transport operations and one for private IFR operators? Please provide comments.

Q27. If you currently conduct GPS IFR operations, how many receivers do you have in your aircraft, and what TSO?

Q28. Do you have any other comments regarding requiring two independent GPS receivers for GPS IFR operations?
Exemption 11/EXE/7

Exemption 11/EXE/7, issued in 2010, applies to all operators conducting IFR operations using GPS equipment as primary means navigation system. Under the exemption operators are exempted from the equipage requirements specified in CAR 19.207(3).

However, to qualify for the exemption, the aircraft must meet a number of conditions:

Q29. Do you currently operate under exemption 11/EXE/7?

Q30. If so, why do you use the exemption? Please provide an outline of the type of aircraft, the operation and location(s) involved.

11/EXE/7 was originally granted to reflect changes in the GPS systems that have occurred since CAR 19D was drafted. Those changes, including an increase in the number of satellites in the GPS system and increased experience in the use of GPS as a navigation system persist today and lend support to the argument that they should be considered as part of a rule change and not as part of an exemption.

This revision would take into account the decision on the use of GNSS sole means in New Zealand. The equipage requirements would be adjusted accordingly.

With regard to the revision of the Rule and the current use of 11/EXE/7, the CAA proposes the following general principles:

- The exemption will remain place while CAA reviews CAR 19D.
- The exemption will be reviewed in the short term to identify any safety issues that have emerged since its release in 2010.
- GNSS navigation equipage requirements will be incorporated into any proposed Rules, effectively superseding 11/EXE/7.

Any changes made will need to meet the overarching principle of increasing aviation safety.

Q31. Do you believe this is an appropriate means of transitioning from the general exemption to a comprehensive revised rule for GNSS IFR operations? Why, or why not?

Q32. If increased equipage requirements were introduced (i.e. two independent GNSS receivers for all passenger transport IFR and one for private IFR) what would be a reasonable transition period?

Q33. Do you have any other comments or observations about moving from exemption-based equipage requirements to rule-based requirements?

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The full conditions are available at: https://www.caa.govt.nz/rules/Exemptions/11_EXE_7.pdf
A minimum standard for GNSS IFR equipment – the rule changes and their relationship to the move towards a PBN environment

New Zealand is moving toward a PBN environment under the banner of New Southern Sky. However, at this stage there is a mix of reliance on ground-based navigation aids, and aircraft flying IFR using GNSS can use a range of GNSS equipment. There is a variety of equipage levels and a mix of capability in the fleet.

The benefits of the current requirements are:

- **Flexibility**: there is a wide range of suitable equipment available
- **Cost**: because the equipment specifications have not kept pace with technological developments, operators have not had to upgrade existing equipment.
- **Simplicity**: the existing equipment is relatively simple to install, is familiar to licensed aircraft maintenance engineers, and does not present the same degree of system integration issues that come with newer, more advanced equipment designed for integrated cockpit designs.

However, there are downsides to the current requirements in relation to the move towards PBN:

- **Reliance on ground-based navigation aids** means that some IFR operators cannot use some aerodromes or specific procedures if, for example, a navigation aid is out for maintenance, or has failed.
- **The mixed equipage** leads to a wide variation in the information available to ATM systems, particularly in an ADS-B environment where older GPS receivers do not provide the same level of detail as more advanced models.
- **Mixed equipage**, particularly at the lower end, erodes the potential national benefits of moving to PBN: safety, efficiency, more direct flight paths and better use of airspace.

Q34. **Do you agree that moving to PBN-based IFR navigation is an appropriate and feasible objective? Why or why not?**

Q35. **What benefits do you see arising from a move to PBN? Who would benefit from these changes?**

Q36. **What costs do you see arising from a move to PBN? On whom would these costs fall?**

Q37. **Do you perceive any safety risks associated with the move to PBN? If so, where would those risks be greatest? Please consider type of operator, operation, geographical area.**
Options for achieving a minimum PBN equipage standard

There are a number of ways that New Zealand could move toward a minimum standard for PBN.

Regulatory options may include requiring operators to upgrade aircraft equipment in order to fly IFR. Non-regulatory options include creating incentives to upgrade early, and providing information, education and training for operators, crew, engineers, design organisations, and avionics suppliers.

A flexible approach is possible. This could include incentives to upgrade early could come in ahead of an equipment mandate, and provide information for operators to make choices about when and how they might upgrade their aircraft equipment.

Table 1 offers examples of some regulatory and non-regulatory options for achieving a minimum PBN standard.

**Table 1**

<table>
<thead>
<tr>
<th>Examples of regulatory options</th>
<th>Examples of non-regulatory options</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Require all <em>current</em> IFR aircraft to achieve a specified standard of navigation performance by a set date.</td>
<td>- <strong>Promotion</strong> of PBN to operators</td>
</tr>
<tr>
<td>Note that this could be done in steps, by aircraft type and use (e.g. recreational vs commercial)</td>
<td>- <strong>Advice</strong> on benefits of PBN</td>
</tr>
<tr>
<td>- <strong>Require</strong> that all <em>newly registered</em> IFR aircraft are fitted to a specified level of avionics performance</td>
<td>- <strong>Training</strong> for licenced aviation maintenance engineers in the selection, fitting, testing and certification of PBN avionics equipment</td>
</tr>
<tr>
<td>- CAA approval of use of partial GNSS sole means for specified routes and aerodromes without navigation aids to be available for appropriately equipped aircraft.</td>
<td>- Facilitation/support of third party (i.e. not CAA) schemes to spread the cost of PBN equipage.</td>
</tr>
<tr>
<td>This would effectively limit non-equipped aircraft to VFR operations in those specified areas/routes</td>
<td>- Airways’ removal of en-route or aerodrome navigation aids, requiring operators to equip to fly GNSS PBN routes</td>
</tr>
<tr>
<td></td>
<td>- A formal policy of ‘best equipped, best served’ maximises benefits for equipped aircraft and increases costs for operators of non-equipped aircraft.</td>
</tr>
</tbody>
</table>
- Requirements for surveillance technologies (for example GNSS receiver performance requirements for ADS-B) that mean all IFR aircraft operating in controlled airspace must have a standard of GNSS receiver equipment that also enables them to fly RNAV/RNP routes

- Advice on equipment options that will provide multiple benefits (e.g. GNSS receivers that will be suitable for PBN and ADS-B surveillance functions)

Q38. Do you think regulatory initiatives to increase PBN equipage levels would be a successful way to achieve the NSS navigation objectives? Why or why not? Please specify which initiative(s) you are commenting on.

Q39. Do you think that non-regulatory initiatives would be effective? If so, which ones, and why? If not, why not?

Q40. Are there any other regulatory or non-regulatory initiatives that you think CAA should consider as a way of increasing uptake of PBN equipment?

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8. Flight operations

This section covers issues and options for the following:

- GPS derived distance information (CAR 19.213)
- Minimum flight altitudes (CAR 19.215)
- Flight paths (19.217)

Key points:

- The current rules for checking the integrity of the GPS signal have not been reviewed in the light of changes in practice, aircraft equipage advances, or the move toward PBN.

CAR 19.213 specifies the provisions of using distance information from the on-board GPS receiver. It covers:

- CAR 19.213(a) Requirement to not use GPS derived distance information if RAIM is unavailable and has been unavailable for preceding ten minutes
- CAR 19.213(b) Reporting requirements when using GPS derived distance information in a position report
- CAR 19.213(c) Use of GPS derived distance to fly ILS/LOC approaches.

**CAR 19.213(a)**

New Zealand CAR 19.213(a) does not differentiate between different phases of flight (i.e. en-route, terminal, and approach. The ten minute RAIM outage provision applies to all phases of the flight.

In contrast, the Australian rules adopt the factory default setting of five minutes, meaning the pilot can continue to navigate using the GNSS equipment without RAIM to land the aircraft within the five minute timeframe.

If the default setting for TSO-C129 and C146a GPS receivers is to allow five minutes for RAIM unavailability during the approach, it raises the question that whether the 10 minutes RAIM unavailability window currently specified in CAR 19.213(a) is still suitable.

Any changes to 19.207 regarding pre-departure RAIM prediction, RAIM warning, and commencement of approaches in the event of a RAIM warning will need to be aligned with requirements for GPS distance derived information.

**Q41. Do you see any merit for New Zealand to adopt a lower tolerance for RAIM unavailability with regard to use of GPS derived distance information?**

**Q42. Are there any other issues you are aware of regarding RAIM unavailability and distance information?**
CAR 19.213(b)
CAR 19.213(b) requires pilots to specify in their position report to Air Traffic Services (ATS) if the distance used is GPS distance.

Pilots cannot use manually created GPS reference points/waypoints for distance measurement and reporting, as the reference points may only be known to themselves and not others.

Q43. Our assessment is that this requirement should be retained in the Rules. Do you agree? Why, or why not?

CAR 19.213(c) Use GPS distance for ILS/DME and LOC/DME approach
CAR 19.213(c) requires pilots to check that the GPS distance to DME used for ILS/DME or LOC/DME approach is measured using the correct DME published on the approach charts. The DME co-ordinates must be ones permanently stored in the database and enacted by name from said database.

The purpose of this section is to ensure pilots check that the GPS distance measurements are made to the correct DME during ILS/DME and LOC/DME approaches.

Although the correct DME coordinates should already be stored in the database and will automatically be used when pilot selects the approach on the GPS unit. This section requests pilots to double check the DME selection will minimise the possibility of using the incorrect distance measurement during the approach.

Q44. Do you agree with the proposal to retain this requirement? If not, why not?

Minimum flight altitudes (19.215)
CAR 19.215 specifies the minimum altitude pilots must adhere to when conducting IFR operations using GPS equipment. Minimum altitude can be either determined by:

- air traffic control; or
- the minimum safe altitude for the route in the published charts.

CAR 19.215 appears to duplicate CAR 91.423, which also specifies the minimum altitude for IFR flight. While there is no doubt that the Rules should cover minimum flight altitudes, the current 19.215 appears to duplicate 91.423.

Q45. Do you agree that the intent of 19.215 is covered by 91.423? If not, why not?

Q46. Are you aware of any other issues relating to minimum safe altitudes for GNSS IFR flight? If so, please provide details.

Flight paths (19.217)
A key difference between satellite navigation and traditional ground based navigation is that satellite navigation allows pilots to operate on what are known as random
unevaluated routes, and requires approval from ATC, whereas ground based navigation does not.

CAR 19.217 allows pilots using satellite navigation to operate on random unevaluated routes above certain specified altitude within the New Zealand FIR and requires approval from ATC. Random flights are also possible below the specified altitude with ATC clearance.

**Q47. Do you agree that the requirements currently under 19.217 remain relevant? If not, why not?**

**Flight plans (19.219)**

CAR 19.219 requires all pilots to notify air traffic services of the use of GPS as primary means by entering the letter ‘G’ on their flight plan.

The key purpose for including such information on the flight plan is to help ATS understand the navigational capacity of the aircraft and pilots. ATS will consider the information and assign routes and deliver clearances.

Contents of flight plan are determined by the ICAO Annex 2 Chapter 3. The standardisation is required to facilitate international flight operations. Amendment to the flight plan format is possible through the ICAO review process.

CAR Part 91.407 (a) (3) (iii) also covers the contents required for an IFR flight plan. It may be possible to merge CAR 19.219 requirements into CAR 91.407.

**Q48. Do you agree that CAR 19.209 requirements are adequately covered by CAR 91.407? If not, why not?**

**Q49. What is the best way to gather information about what type of navigation pilots are using? Do you have any suggestions?**
9. Pilot and crew training

This section includes commentary and options on the following issues:

- Current GNSS IFR pilot qualification requirements
- Linking pilot qualifications to the GPS/FMS make and model
- Pilot qualification and GNSS IFR navigation in the future

Key points:

- There is no current requirement for pilots to demonstrate competency using GPS for navigation as part of their IFR training and ongoing competency checks.

- The current rules require that where pilots do use GPS, they must demonstrate competency on specific models of GPS receiver or flight management system (FMS). If and when GNSS models become more similar, this requirement may need to be revised.

- Technology is rapidly advancing. It’s important that the pilot and crew training requirements around the use of GPS are future-proofed. This includes looking ahead to the use of GNSS multi-constellation receivers, and other forms of GNSS in an integrated cockpit environment and the necessary training requirements.

The current GNSS IFR pilot qualification requirements

Pilot qualification requirements in CAR 19.205 are additional to those set out in CAR 61 Subpart Q – instrument ratings, CAR 61.29 and 61.21 which cover pilot logbooks and flight tests respectively.

CAR 19.201(c) excludes pilots flying for Australian operators with Australia-New Zealand Aviation agreement (ANZA) privileges. This exclusion exists to satisfy New Zealand’s obligations under the Trans-Tasman Mutual Recognition Agreement and the ANZA agreement. CAA does not propose to remove this exclusion.

Q50. Are you aware of any problems with the current IFR qualification framework? If so, please provide a detailed explanation of the problem(s), the importance and impact of the problems.

Linking qualification and GPS / FMS make and model

The current rule CAR 19.205(a) and (b) requires that pilots must have demonstrated competency in the use of GPS IFR approach procedure. Pilots must also demonstrate competency in a flight test. Approach and flight test competency is linked to a particular make and model of GPS receiver or flight management system (FMS).

The rationale for coupling the logbook endorsement to a specific make and model of GPS receiver or FMS lies with the fact that there was significant variation between earlier models of GPS receivers and flight management systems. Switching between models of GPS receivers presented a human machine interface (HMI) risk. This risk was mitigated by
linking the qualification to the receiver or FMS model. It is possible to hold endorsements for multiple GPS/FMS models.

TSO-C145 and 146 models are more alike; however variations do exist and a large number of TSO-C129 receivers are available for sale and installed for use in aircraft in New Zealand.

Q51. Do you believe that a GPS IFR endorsement should be specific to a make and model of receiver / FMS? Why or why not?

Q52. What costs or benefits are there to retaining or removing the link between the endorsement and the make and model? Where would the costs and benefits fall?

Pilot qualification and GNSS navigation in the future

GNSS navigation is not currently a compulsory component of the IFR training syllabus. Pilots must demonstrate competency using VOR for their primary IFR licence, and can choose either ADF or GNSS.

In normal operations, the pilot/crew workload would be similar to procedures now used into aerodromes without a conventional navigation aid, coupled with appropriate extraction procedures and alternates.

Skills like dead reckoning (DR) are part of the pilot training curriculum; however there are limitations to the utility of DR, particularly in instrument meteorological conditions and/or on approach. Rapid reversion from GNSS to conventional navigation aid could also increase workload and complicate procedures.

There are a number of requirements on operators to demonstrate and maintain skills, and also to plan and conduct operations with built-in contingency procedures and alternates that link to the current IFR pilot endorsements.

Q53. Are there any other issues that we should consider regarding pilot competency and GNSS navigation?

Q54. Should GNSS navigation be a mandatory component of the IFR training syllabus? Why, or why not?

Q55. Should pilot qualification requirements for GNSS differentiate between stand-alone GNSS receivers and flight management systems? Why, or why not?

Q56. What impact would a separate GNSS qualification requirement have on your operation? Please provide details of costs and potential benefits.

Q57. In your opinion, is the current GNSS training syllabus sufficient to support safe operations in normal and non-normal (e.g. loss of GNSS signal, reversion to conventional systems, use of DR) operating conditions? Why, or why not?
Appendix A: Tables of Identified Issues

The following four tables outline the specific issues identified to date with Part 19D, aligned with the themes discussed in this document. Each issue includes a brief summary of the evidence indicating why the issue may need to be addressed and an option for resolving the issue, along with a brief outline of the potential impacts if that proposal were progressed. Each issue is identified by an “Issue number” for reference purposes.

Table A.1 – Means of navigation issues

<table>
<thead>
<tr>
<th>Issue number</th>
<th>Rule/AC</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipage requirements</td>
<td>19.207</td>
<td>The rule references out of date equipment and associated CAA forms</td>
</tr>
<tr>
<td>RAIM prediction</td>
<td>19.207</td>
<td>RAIM timing requirements for phases of flights, timing and FMS are out of line with other states and ICAO</td>
</tr>
<tr>
<td>Alternate aerodromes</td>
<td>19.207</td>
<td>Whether or not an aircraft flying GNSS can have as an alternate an aerodrome without a navigation aid</td>
</tr>
<tr>
<td>Out of date TSO</td>
<td>19.211</td>
<td>The prescribed TSO is out of date</td>
</tr>
</tbody>
</table>

Table A.2 – Aircraft equipage issues

<table>
<thead>
<tr>
<th>Issue number</th>
<th>Rule/AC</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of IFR navigation units required</td>
<td>19.207</td>
<td>Whether or not there should be non-GPS navigation equipment for primary means navigation and what form this equipage should take.</td>
</tr>
<tr>
<td>Exemption - 11/EXE/7</td>
<td>19.207</td>
<td>Those operators that currently have the exemption will need to transition to the new rule provisions</td>
</tr>
<tr>
<td>A minimum standard for GNSS IFR equipment – moving toward a PBN environment</td>
<td>19.207</td>
<td>The current requirements are ill placed to make the most of the PBN environment and the most efficient use of existing infrastructure.</td>
</tr>
</tbody>
</table>
### Table A.3 – Flight operations issues

<table>
<thead>
<tr>
<th>Issue number</th>
<th>Rule/AC</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIM</td>
<td>CAR 19.213(a)</td>
<td>Currently pilots cannot use information derived from GPS when RAIM has been unavailable for longer than ten minutes</td>
</tr>
<tr>
<td>Reporting GPS distance</td>
<td>CAR 19.213(b) Reporting GPS distance</td>
<td>Pilots must currently specify their position to ATS using GPS reference points stored in the database. Pilots cannot enter manually created GPS references points.</td>
</tr>
<tr>
<td>Use GPS distance for ILS/DME and LOC/DME approach</td>
<td>CAR 19.213(c)</td>
<td>Pilots are required to make sure the GPS distance to DME used for ILS/DME or LOC/DME approach is measured using the correct DME published on the approach charts</td>
</tr>
<tr>
<td>Minimum flight altitudes</td>
<td>19.215</td>
<td>This specifies the minimum altitudes.</td>
</tr>
<tr>
<td>Flight paths</td>
<td>19.217</td>
<td>This rule sets the differences between what is required when using GNSS or traditional ground based navigation. Pilots navigating by GNSS can operate on random unevaluated routes above certain altitudes under certain circumstances.</td>
</tr>
<tr>
<td>Flight plans</td>
<td>19.219</td>
<td>This requires all pilots to notify air traffic services (ATS) by entering the letter ‘G’ on their flight plan if they intend to conduct IFR operations using GPS as primary or sole means navigation system.</td>
</tr>
</tbody>
</table>

### Table A.4 – Pilot/crew Training issues

<table>
<thead>
<tr>
<th>Issue number</th>
<th>Rule/AC</th>
<th>Issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linking qualifications and GPS/FMS make and model</td>
<td>19.205 (a) and (b)</td>
<td>This rule requires pilots to have demonstrated competency in the use of GPS IFR approaches.</td>
</tr>
<tr>
<td>Pilot qualifications and GNSS in the future</td>
<td>Part 61</td>
<td>Whether or not the future rule set should include pilot competency requirements for GNSS sole means navigation now and in a future PBN environment.</td>
</tr>
</tbody>
</table>
Appendix B: Summary of questions asked in the discussion document

Means of navigation

CAR 19.207 – Primary means GPS operations

Q1. Do you agree that this is an accurate description of the current problem with equipment specifications in CAR 19.207? If not, why not?

Q2. Are you aware of any other issues related to these equipage requirements? If so, please provide details.

Q3. Do you agree that this is an accurate description of the current RAIM prediction services and requirements? If not, why not? Please provide details of any additional issues, or clarification of those listed above.

Q4. Do you agree that this is an accurate description of the current RAIM prediction services and requirements? If not, why not? Please provide details of any additional issues, or clarification of those listed above.

Q5. Do you know of any specific issues relating to RAIM outages in New Zealand?

Q6. If you need RAIM prediction for your operation, what service(s) do you use? Do you have any observations about the quality of the service(s)?

Q7. If the requirements for RAIM prediction were strengthened, for example a five minute RAIM warning and/or a requirement for RAIM prediction prior to departure and en-route, what impact would this have on your operations? Please consider both positive and negative impacts.

Q8. Do you believe that there should be different requirements for integrity monitoring for aircraft with FMS and those with standalone GNSS receivers? Why, or why not?

Q9. Do you support performance requirements for RAIM prediction services? Why, or why not?

Q10. Do you have any comment related to either satisfying the conditions under 91.405 OR identifying an aerodrome that meets the requirements of 19.207(9)?

CAR 19.209: Sole means GNSS operations

Q10. Do you fly IFR sectors using only GPS now?

Q11. If so, what do you perceive as the benefits of the current approach?

Q12. What do you perceive to be the risks of the current approach?

Q13. Do you have any other comments regarding the current system?
Q14. What issues do you foresee regarding requirements for a non-GNSS alternate aerodrome in a limited sole means environment? What would be the costs, benefits, and/or risks?

**CAR 19.211: Supplemental means GNSS operations**

Q15. Is this your understanding of supplemental means?

Q16. Do you currently use a form of supplemental means for GPS operations?

Q17. If so, what equipment do you use? What benefits are there to using supplemental means?

Q18. What risks do you see with the use of supplemental means?

Q19. Do you agree that these are the main issues concerning supplemental means? If not, what other issues do you think should be considered?

There are two options that could be used to address the issues identified above.

Option 1: Continue to allow the use of supplemental means as status quo

Option 2: Apply performance requirements to GPS equipment to be used as supplemental means

Q20. Which of these options do you prefer? Why?

Q21. Are there any other options or actions that you would suggest regarding supplemental means? If so, please provide details.

**Aircraft equipage for GNSS IFR operations**

Q22. Do you agree with this description of the issues with current GNSS IFR equipage requirements? If not, why not?

Q23. Are there any other issues that we should be considering? If so, please provide details of the costs, risks, or benefits that arise from those issues.

Q24. Do you agree that there should be a requirement for aircraft to be equipped with non-GPS navigation equipment requirements for primary means operations? Why, or why not?

Q25. Do you believe there should be any requirements specific to carriage of VOR/DME or ADF receivers? If so, why?

Q26. Do you think there should be different equipage requirements for different types of operators and operations, for example two receivers for transport operations and one for private IFR operations? Please provide comments.

Q27. If you currently conduct GPS IFR operations, how many receivers do you have in your aircraft, and what TSO?
Q28. Do you have any other comments regarding requiring two independent GPS receivers for GPS IFR operations?

Q29. Do you currently operate under exemption 11/EXE/7?

Q30. If so, why do you use the exemption? Please provide an outline of the type of aircraft, the operation and location(s) involved.

Q31. Do you believe this is an appropriate means of transitioning from the general exemption to a comprehensive revised rule for GNSS IFR operations? Why, or why not?

Q32. If increased equipage requirements were introduced (i.e. two independent GPS receivers for all passenger transport IFR and one for private IFR) what would be a reasonable transition period?

Q33. What benefits do you see arising from a move to PBN? Who would benefit from these changes?

Q34. What costs do you see arising from a move to PBN? On whom would these costs fall?

Q35. Do you perceive any safety risks associated with the move to PBN? If so, where would those risks be greatest? Please consider type of operator, operation, geographical area.

Q36. NSS receivers for all passenger transport IFR and one for private IFR) what would be a reasonable transition period?

Q37. Do you have any other comments or observations about moving from exemption-based equipage requirements to rule-based requirements?

Q38. Do you think regulatory initiatives to increase PBN equipage levels would be a successful way to achieve the NSS navigation objectives? Why or why not? Please specify which initiative(s) you are commenting on.

Q39. Do you think that non-regulatory initiatives would be effective? If so, which ones, and why? If not, why not?

Q40. Are there any other regulatory or non-regulatory initiatives that you think CAA should consider as a way of increasing uptake of PBN equipment?

Flight operations

Q41. Do you see any merit for New Zealand to adopt a lower tolerance for RAIM unavailability with regard to use of GPS derived distance information?

Q42. Are there any other issues you are aware of regarding RAIM unavailability and distance information?

Q43. Our assessment is that this requirement should be retained in the Rules. Do you agree? Why, or why not?

Q44. Do you agree with the proposal to retain this requirement? If not, why not?

Q45. Do you agree that the intent of 19.215 is covered by 91.423? If not, why not?

Q46. Are you aware of any other issues relating to minimum safe altitudes for GNSS IFR flight? If so, please provide details.

Q47. Do you agree that the requirements currently under 19.217 remain relevant? If not, why not?

Q48. Do you agree that CAR 19.209 requirements are adequately covered by CAR 91.407? If not, why not?

Q49. What is the best way to gather information about what type of navigation pilots are using? Do you have any suggestions?

Pilot and crew training

Q50. Are you aware of any problems with the current IFR qualification framework? If so, please provide a detailed explanation of the problem(s), the importance and impact of the problems.

Q51. Do you believe that a GPS IFR endorsement should be specific to a make and model of receiver / FMS? Why or why not?

Q52. What costs or benefits are there to retaining or removing the link between the endorsement and the make and model? Where would the costs and benefits fall?

Q53. Are there any other issues that we should consider regarding pilot competency and GNSS navigation?

Q54. Should GNSS navigation be a mandatory component of the IFR training syllabus? Why, or why not?

Q55. Should pilot qualification requirements for GNSS differentiate between stand-alone GNSS receivers and flight management systems? Why, or why not?

Q56. What impact would a separate GNSS qualification requirement have on your operation? Please provide details of costs and potential benefits.

Q57. In your opinion, is the current GNSS training syllabus sufficient to support safe operations in normal and non-normal (e.g. loss of GNSS signal, reversion to conventional systems, use of DR) operating conditions? Why, or why not?
Appendix C: Feedback Form

The questions posed throughout this document are collated above. This feedback form is also available as a separate document on our website at http://www.caa.govt.nz/index.html. We are also interested in any views you may have that are not covered by these questions.

Please submit your response by Friday 18 March, 2016 to:

**E-mail:** docket@caa.govt.nz  **please use “IFR GNSS” in the subject line**  
**Post:** Jonathan Barron  
Senior Policy Advisor  
Civil Aviation Authority  
PO Box 3555  
Wellington 6140

**Submitter’s details:**  
Individual □ Organisation □ (*please tick one*)

Name:

Contact information:

Email:

Address:

Telephone:

Type of operation: